



NAVAL FACILITIES ENGINEERING SERVICE CENTER
Port Hueneme, California 93043-4370

Technical Report
TR-6014-OCN

MOORING DESIGN PHYSICAL AND EMPIRICAL DATA

by

NFESC Staff

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13. ABSTRACT (Maximum 200 words) The Naval Facilities Engineering Command Criteria Office tasked the Naval Facilities Engineering Service Center (NFESC) to compile a database of mooring hardware information to support MIL-HDBK-1026/4 'Mooring Design', which is in preparation. This report provides selected physical and empirical data useful for mooring design.				
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EXECUTIVE SUMMARY

The Naval Facilities Engineering Command Criteria Office tasked the Naval Facilities Engineering Service Center (NFESC) to compile a database of mooring hardware information to support MIL-HDBK-1026/4 'Mooring Design', which is in preparation. This report provides selected physical and empirical data useful for mooring design.

This report consists of a directory that lists the type of information provided, its subdirectory, the name and type of the file. In some cases the same information is provided in various forms (for example, as both a spread sheet and a picture of the spread sheet in image form), because engineers may wish to use the files in various ways.

DIRECTORY

This table lists the types of information provided, its directory, file name and file type.

Table. Listing of Empirical Information

<i>ITEM</i>	<i>FILENAME</i>	<i>DESCRIPTION</i>
A1	a1.xls	Capacity of Standard Navy Fleet Moorings
A2	a2.dxf	Types of Drag - Embedment Anchors
A2	a2.pcx	Types of Drag - Embedment Anchors
A3	a3.dxf	Types of Pile Anchors
A3	a3.pcx	Types of Pile Anchors
A4	a4.dxf	Types of Deadweight Anchors
A4	a4.pcx	Types of Deadweight Anchors
A5	a5.dxf	Concrete Sinker Used in Standard Navy Moorings
A5	a5.pcx	Concrete Sinker Used in Standard Navy Moorings
A6	a6.dxf	Riser-Type Buoys
A6	a6.pcx	Riser-Type Buoys
A7	a7.dxf	Marker Buoy
A7	a7.pcx	Marker Buoy
B1	b1.dxf	Large Double Bitt With Lip
B1	b1.pcx	Large Double Bitt With Lip
B2	b2.dxf	Low Double Bitt w/ Lip
B2	b2.pcx	Low Double Bitt w/ Lip
B3	b3.dxf	Special Mooring Bollard "A"
B3	b3.pcx	Special Mooring Bollard "A"
B4	b4.dxf	Special Mooring Bollard "B"
B4	b4.pcx	Special Mooring Bollard "B"
B5	b5.dxf	Large Bollard With Horn
B5	b5.pcx	Large Bollard With Horn
B6	b6.dxf	42" Cleat
B6	b6.pcx	42" Cleat
B7	b7.dxf	30" Cleat
B7	b7.pcx	30" Cleat
C1	c1.dxf	Common Stud Link Chain
C1	c1.pcx	Common Stud Link Chain
C2	c2.dxf	Chain Joining Link
C2	c2.pcx	Chain Joining Link
C3	c3.dxf	Anchor Joining Link
C3	c3.pcx	Anchor Joining Link
C4	c4.dxf	Ground Ring
C4	c4.pcx	Ground Ring

C5	c5a.dxf	Swivel Shackle (Page 1 of 2)
C5	c5a.pcx	Swivel Shackle (Page 1 of 2)
C5	c5b.dxf	Swivel Shackle (Page 2 of 2)
C5	c5b.pcx	Swivel Shackle (Page 2 of 2)
C6	c6.dxf	Spider Plate
C6	c6.pcx	Spider Plate
C7	c7.dxf	Plate Sinker Shackle
C7	c7.pcx	Plate Sinker Shackle
C8	c8.dxf	Pear Link
C8	c8.pcx	Pear Link
C9	c9.dxf	End Link
C9	c9.pcx	End Link
C10	c10.dxf	Joining Shackle
C10	c10.pcx	Joining Shackle
C11	c11.dxf	Anchor Shackle
C11	c11.pcx	Anchor Shackle
C12	c12.dxf	Buoy Shackle
C12	c12.pcx	Buoy Shackle
C13	c13.xls	Mechanical Properties
C14	c14.xls	Physical Properties of Finished Chain and Accessories
C15	c15a.dxf	Buoy, Mooring, Foam Filled, Polyurethane, 8 Ft Dia, Class AA, General Arrangement & Parts List
C15	c15a.pcx	Buoy, Mooring, Foam Filled, Polyurethane, 8 Ft Dia, Class AA, General Arrangement & Parts List
C15	c15b.dxf	Buoy, Mooring, Foam Filled, Polyurethane, 11.5 Ft Dia, Class AA, General Arrangement & Parts List
C15	c15b.pcx	Buoy, Mooring, Foam Filled, Polyurethane, 11.5 Ft Dia, Class AA, General Arrangement & Parts List
D1	d1e6.xls	Predicted Single Anchor Drag Distances - Stockless Anchor, Stabilizers & Flukes at 45 degrees, Seafloor Type = Mud
D1	d1e7.xls	Predicted Single Anchor Drag Distances - Stockless Anchor, Stabilizers & Flukes at 36 degrees, Seafloor Type = Sand
D1	d1e8.xls	Predicted Single Anchor Drag Distances - Stato Anchor, Stabilizers & Flukes at 50 degrees, Seafloor Type = Mud
D1	d1e9.xls	Predicted Single Anchor Drag Distances - Stato Anchor, Stabilizers & Flukes at 30 degrees, Seafloor Type = Sand
D2	d2e10.xls	Predicted Single Anchor Drag Distances - Tandem Stockless Anchor, Stabilizers & Flukes at 45 degrees, Seafloor Type = Mud
D2	d2e11.xls	Predicted Single Anchor Drag Distances - Tandem Stockless Anchor, Stabilizers & Flukes at 36 degrees, Seafloor Type = Sand
D2	d2e12.xls	Predicted Single Anchor Drag Distances - Tandem Stockless Anchor, Stabilizers & Flukes at 50 degrees, Seafloor Type = Mud
D2	d2e13.xls	Predicted Single Anchor Drag Distances - Tandem Stockless Anchor, Stabilizers & Flukes at 30 degrees, Seafloor Type = Sand
E1	e154.dxf	Spherical Marker or Mooring Buoy
E1	e154.pcx	Spherical Marker or Mooring Buoy
E1	e155.dxf	Spherical Marker or Mooring Buoy
E1	e155.pcx	Spherical Marker or Mooring Buoy
E1	e156.dxf	Spherical Marker or Mooring Buoy
E1	e156.pcx	Spherical Marker or Mooring Buoy

E1	e157.dxf	Tension Bar Mooring Buoys
E1	e157.pcx	Tension Bar Mooring Buoys
E1	e158.dxf	Tension Bar Mooring Buoys
E1	e158.pcx	Tension Bar Mooring Buoys
E1	e159.dxf	Hawsepipe and Tension Bar Buoys
E1	e159.pcx	Hawsepipe and Tension Bar Buoys
E1	e160.dxf	Hawsepipe and Tension Bar Mooring Buoys
E1	e160.pcx	Hawsepipe and Tension Bar Mooring Buoys
E1	e162.dxf	Concrete Sinkers
E1	e162.pcx	Concrete Sinkers
E1	e165.xls	Holding Power to Weight Ratio of Various Anchors
E1	e169a.xls	Moorings Without Sinkers Bills of Materials
E1	e170.xls	Moorings Without Sinkers Chain Set Assembly for Basic Depth
E1	e171.xls	Moorings Without Sinkers Lengths of Ground Chain Required for Various Water Depths
E1	e172.dxf	Moorings Without Sinkers Chain Set Assemblies for Various Water Depths
E1	e172.pcx	Moorings Without Sinkers Chain Set Assemblies for Various Water Depths
E1	e174.xls	Moorings Without Sinkers Bills of Materials
E1	e175.xls	Moorings Without Sinkers Chain Set Assembly for Basic Depth
E1	e176.xls	Moorings Without Sinkers Maximum Mooring Depths With Various Buoys
E1	e178.dxf	Moorings Without Sinkers Chain Set Assemblies for Various Water Depths
E1	e178.pcx	Moorings Without Sinkers Chain Set Assemblies for Various Water Depths
E1	e177.xls	Moorings Without Sinkers Lengths of Ground Chain Required for Various Water Depths
E1	e181.xls	Moorings With Sinkers - Bills of Materials
E1	e182.xls	Moorings With Sinkers - Chain Set Assembly for Basic Depth
E1	e183.xls	Moorings With Sinkers - Maximum Mooring Depths With Various Buoys
E1	e184.xls	Moorings With Sinkers - Lengths of Ground Chain Required for Various Water Depths
E1	e185.xls	Moorings With Sinkers - Chain Set Assemblies for Various Depths
E2	e2_1.dxf	Free-Swinging, Riser-Type Mooring Without Sinkers - Classes AAA and BBB (Proposed)
E2	e2_1.pcx	Free-Swinging, Riser-Type Mooring Without Sinkers - Classes AAA and BBB (Proposed)
E2	e2_2.dxf	Free-Swinging, Riser Type Mooring Without Sinkers - Class AA, BB, and CC
E2	e2_2.pcx	Free-Swinging, Riser Type Mooring Without Sinkers - Class AA, BB, and CC
E2	e2_3.dxf	Free-Swinging, Riser-Type Mooring Without Sinkers - Class DD
E2	e2_3.pcx	Free-Swinging, Riser-Type Mooring Without Sinkers - Class DD
E2	e2_4.dxf	Free-Swinging, Riser-Type Mooring Without Sinkers - Class A, B, C, D, E, F, and G
E2	e2_4.pcx	Free-Swinging, Riser-Type Mooring Without Sinkers - Class

		A, B, C, D, E, F, and G
E2	e2_5.dxf	Free-Swinging, Riser-Type Mooring With Sinkers - Classes A, B, C, D, and E
E2	e2_5.pcx	Free-Swinging, Riser-Type Mooring With Sinkers - Classes A, B, C, D, and E
E3	e3 10.dxf	Tension Bar Mooring Buoy
E3	e3 10.pcx	Tension Bar Mooring Buoy
E3	e3 11.dxf	Hawsepipe Mooring Buoy
E3	e3 11.pcx	Hawsepipe Mooring Buoy
E3	e3 12.dxf	Tension Bar Mooring Buoy
E3	e3 12.pcx	Tension Bar Mooring Buoy
E3	e3 9.dxf	Standard Marker or Mooring Buoy
E3	e3 9.pcx	Standard Marker or Mooring Buoy
F1	f1.dxf	Recommended NAVMOOR Anchor Size for Navy Fleet Moorings
F1	f1.pcx	Recommended NAVMOOR Anchor Size for Navy Fleet Moorings
F	f10000.dxf	Plan View - 10K navmoor Anchor
F	f10000.pcx	Plan View - 10K navmoor Anchor
F	f12000.dxf	Anchor Assembly, Mooring NAVMOOR-10, 12000 Pounds
F	f12000.pcx	Anchor Assembly, Mooring NAVMOOR-10, 12000 Pounds
F	f18000.dxf	Anchor Assembly, Mooring NAVMOOR-15, 18000 Pounds
F	f18000.pcx	Anchor Assembly, Mooring NAVMOOR-15, 18000 Pounds
F	f2400.dxf	NAVMOOR-2 Mooring Anchor 2,400 lbs. (wt.) General Assembly
F	f2400.pcx	NAVMOOR-2 Mooring Anchor 2,400 lbs. (wt.) General Assembly
F	f2700.dxf	NAVMOOR-6 Salvage Anchor 7,200 lbs. (wt.) General Assembly
F	f2700.pcx	NAVMOOR-6 Salvage Anchor 7,200 lbs. (wt.) General Assembly
G1	g1.dxf	Common Wire Rope Construction Examples
G1	g1.pcx	Common Wire Rope Construction Examples
G2	g2.xls	Fiber Rope Specification
G3	g3.xls	Plain-Laid Rope Construction
G4	g4a.xls	Braided Rope Construction
G4	g4b.xls	Braided Rope Construction - Continued
H1	h1b.dxf	Driven Plate Anchor Configuration
H1	h1b.pcx	Driven Plate Anchor Configuration
H2	h2.dxf	Anchor-Follower Assembly
H2	h2.pcx	Anchor-Follower Assembly
I1	i1.dxf	Variation of Bollard Pull with Shaft Speed for ARS-38 Class Ships
I1	i1.pcx	Variation of Bollard Pull with Shaft Speed for ARS-38 Class Ships
I2	i2.dxf	Variation of Bollard Pull with Shaft Speed and Propeller Pitch for ARS-50 Class Ships
I2	i2.pcx	Variation of Bollard Pull with Shaft Speed and Propeller Pitch for ARS-50 Class Ships
I3	i3.dxf	Bollard Pull vs. Shaft Speed and Propeller Pitch For T-ATF-169 Class Ship Without Kort Nozzle
I3	i3.pcx	Bollard Pull vs. Shaft Speed and Propeller Pitch For T-ATF-169 Class Ship Without Kort Nozzle
J1	j1.dxf	Chocks for Nylon Rope
J1	j1.pcx	Chocks for Nylon Rope
J2	j2.dxf	Bitts for Nylon Rope
J2	j2.pcx	Bitts for Nylon Rope
J3	j3.dxf	Vertical Howser Reels
J3	j3.pcx	Vertical Howser Reels
J4	j4.dxf	Horizontal Hawser Reels

J4	j4.pcx	Horizontal Hawser Reels
J5	j5.dxf	Capstan Head Sizes for Nylon Ropes
J5	j5.pcx	Capstan Head Sizes for Nylon Ropes
J6	j6_54.xls	Three-Strand Nylon Rope
J6	j6_55.xls	Plaited Nylon
J6	j6_56.xls	Double Braided Nylon Rope
J6	j6_57.xls	Plaited Continuous Polyester Filament with Staple Wrap & Three-Strand Polyester
J6	j6_58.xls	Three-Strand Polypropylene & Double Braided Polyester Filament With Staple Wrap
J6	j6_59.xls	Three-Strand Dual Fiber & Plaited Dual Fiber
J7	j7.xls	Minimum Number of Lines Used in Preliminary Mooring Analysis
K1	k1.dxf	U.S. Navy Stockless Anchor
K1	k1.pcx	U.S. Navy Stockless Anchor
L1	L1.WK1	NAVSEASYSCOM allhulls listing of ship information
L2	L2.xls	NAVSEASYSCOM ship chain specification data
L3	L3.xls	NAVSEASYSCOM fiber rope specification data
L4	L4.xls	NAVSEASYSCOM shackle specification data
L5	L5.xls	NAVSEASYSCOM wire rope specification data

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APPENDIX A

MOORING DESIGN PHYSICAL AND EMPIRICAL DATA

APPENDIX A
MOORING DESIGN PHYSICAL AND EMPIRICAL DATA

This appendix includes various supporting figures, tables and drawings in digital form that support the handbook. Table A-1 lists the file names and gives a description of each data file.

Table A-1. Listing of Empirical Information

ITEM	FILENAME	DESCRIPTION
A1	a1.xls	Capacity of Standard Navy Fleet Moorings
A2	a2.dxf	Types of Drag - Embedment Anchors
A2	a2.pcx	Types of Drag - Embedment Anchors
A3	a3.dxf	Types of Pile Anchors
A3	a3.pcx	Types of Pile Anchors
A4	a4.dxf	Types of Deadweight Anchors
A4	a4.pcx	Types of Deadweight Anchors
A5	a5.dxf	Concrete Sinker Used in Standard Navy Moorings
A5	a5.pcx	Concrete Sinker Used in Standard Navy Moorings
A6	a6.dxf	Riser-Type Buoys
A6	a6.pcx	Riser-Type Buoys
A7	a7.dxf	Marker Buoy
A7	a7.pcx	Marker Buoy
B1	b1.dxf	Large Double Bitt With Lip
B1	b1.pcx	Large Double Bitt With Lip
B2	b2.dxf	Low Double Bitt w/ Lip
B2	b2.pcx	Low Double Bitt w/ Lip
B3	b3.dxf	Special Mooring Bollard "A"
B3	b3.pcx	Special Mooring Bollard "A"
B4	b4.dxf	Special Mooring Bollard "B"
B4	b4.pcx	Special Mooring Bollard "B"
B5	b5.dxf	Large Bollard With Horn
B5	b5.pcx	Large Bollard With Horn
B6	b6.dxf	42" Cleat
B6	b6.pcx	42" Cleat
B7	b7.dxf	30" Cleat
B7	b7.pcx	30" Cleat
C1	c1.dxf	Common Stud Link Chain
C1	c1.pcx	Common Stud Link Chain
C2	c2.dxf	Chain Joining Link
C2	c2.pcx	Chain Joining Link
C3	c3.dxf	Anchor Joining Link

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C3	c3.pcx	Anchor Joining Link
C4	c4.dxf	Ground Ring
C4	c4.pcx	Ground Ring
C5	c5a.dxf	Swivel Shackle (Page 1 of 2)
C5	c5a.pcx	Swivel Shackle (Page 1 of 2)
C5	c5b.dxf	Swivel Shackle (Page 2 of 2)
C5	c5b.pcx	Swivel Shackle (Page 2 of 2)
C6	c6.dxf	Spider Plate
C6	c6.pcx	Spider Plate
C7	c7.dxf	Plate Sinker Shackle
C7	c7.pcx	Plate Sinker Shackle
C8	c8.dxf	Pear Link
C8	c8.pcx	Pear Link
C9	c9.dxf	End Link
C9	c9.pcx	End Link
C10	c10.dxf	Joining Shackle
C10	c10.pcx	Joining Shackle
C11	c11.dxf	Anchor Shackle
C11	c11.pcx	Anchor Shackle
C12	c12.dxf	Buoy Shackle
C12	c12.pcx	Buoy Shackle
C13	c13.xls	Mechanical Properties
C14	c14.xls	Physical Properties of Finished Chain and Accessories
C15	c15a.dxf	Buoy, Mooring, Foam Filled, Polyurethane, 8 Ft Dia, Class AA, General Arrangement & Parts List
C15	c15a.pcx	Buoy, Mooring, Foam Filled, Polyurethane, 8 Ft Dia, Class AA, General Arrangement & Parts List
C15	c15b.dxf	Buoy, Mooring, Foam Filled, Polyurethane, 11.5 Ft Dia, Class AA, General Arrangement & Parts List
C15	c15b.pcx	Buoy, Mooring, Foam Filled, Polyurethane, 11.5 Ft Dia, Class AA, General Arrangement & Parts List
D1	d1e6.xls	Predicted Single Anchor Drag Distances - Stockless Anchor, Stabilizers & Flukes at 45 degrees, Seafloor Type = Mud
D1	d1e7.xls	Predicted Single Anchor Drag Distances - Stockless Anchor, Stabilizers & Flukes at 36 degrees, Seafloor Type = Sand
D1	d1e8.xls	Predicted Single Anchor Drag Distances - Stato Anchor, Stabilizers & Flukes at 50 degrees, Seafloor Type = Mud
D1	d1e9.xls	Predicted Single Anchor Drag Distances - Stato Anchor, Stabilizers & Flukes at 30 degrees, Seafloor Type = Sand
D2	d2e10.xls	Predicted Single Anchor Drag Distances - Tandem Stockless Anchor, Stabilizers & Flukes at 45 degrees, Seafloor Type = Mud
D2	d2e11.xls	Predicted Single Anchor Drag Distances - Tandem Stockless Anchor, Stabilizers & Flukes at 36 degrees, Seafloor Type = Sand
D2	d2e12.xls	Predicted Single Anchor Drag Distances - Tandem Stockless Anchor, Stabilizers & Flukes at 50 degrees, Seafloor Type = Mud
D2	d2e13.xls	Predicted Single Anchor Drag Distances - Tandem Stockless

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		Anchor, Stabilizers & Flukes at 30 degrees, Seafloor Type = Sand
E1	e154.dxf	Spherical Marker or Mooring Buoy
E1	e154.pcx	Spherical Marker or Mooring Buoy
E1	e155.dxf	Spherical Marker or Mooring Buoy
E1	e155.pcx	Spherical Marker or Mooring Buoy
E1	e156.dxf	Spherical Marker or Mooring Buoy
E1	e156.pcx	Spherical Marker or Mooring Buoy
E1	e157.dxf	Tension Bar Mooring Buoys
E1	e157.pcx	Tension Bar Mooring Buoys
E1	e158.dxf	Tension Bar Mooring Buoys
E1	e158.pcx	Tension Bar Mooring Buoys
E1	e159.dxf	Hawsepipe and Tension Bar Buoys
E1	e159.pcx	Hawsepipe and Tension Bar Buoys
E1	e160.dxf	Hawsepipe and Tension Bar Mooring Buoys
E1	e160.pcx	Hawsepipe and Tension Bar Mooring Buoys
E1	e162.dxf	Concrete Sinkers
E1	e162.pcx	Concrete Sinkers
E1	e165.xls	Holding Power to Weight Ratio of Various Anchors
E1	e169a.xls	Moorings Without Sinkers Bills of Materials
E1	e170.xls	Moorings Without Sinkers Chain Set Assembly for Basic Depth
E1	e171.xls	Moorings Without Sinkers Lengths of Ground Chain Required for Various Water Depths
E1	e172.dxf	Moorings Without Sinkers Chain Set Assemblies for Various Water Depths
E1	e172.pcx	Moorings Without Sinkers Chain Set Assemblies for Various Water Depths
E1	e174.xls	Moorings Without Sinkers Bills of Materials
E1	e175.xls	Moorings Without Sinkers Chain Set Assembly for Basic Depth
E1	e176.xls	Moorings Without Sinkers Maximum Mooring Depths With Various Buoys
E1	e178.dxf	Moorings Without Sinkers Chain Set Assemblies for Various Water Depths
E1	e178.pcx	Moorings Without Sinkers Chain Set Assemblies for Various Water Depths
E1	e177.xls	Moorings Without Sinkers Lengths of Ground Chain Required for Various Water Depths
E1	e181.xls	Moorings With Sinkers - Bills of Materials
E1	e182.xls	Moorings With Sinkers - Chain Set Assembly for Basic Depth
E1	e183.xls	Moorings With Sinkers - Maximum Mooring Depths With Various Buoys
E1	e184.xls	Moorings With Sinkers - Lengths of Ground Chain Required for Various Water Depths
E1	e185.xls	Moorings With Sinkers - Chain Set Assemblies for Various Depths
E2	e2_1.dxf	Free-Swinging, Riser-Type Mooring Without Sinkers - Classes AAA and BBB (Proposed)

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E2	e2_1.pcx	Free-Swinging, Riser-Type Mooring Without Sinkers - Classes AAA and BBB (Proposed)
E2	e2_2.dxf	Free-Swinging, Riser Type Mooring Without Sinkers - Class AA, BB, and CC
E2	e2_2.pcx	Free-Swinging, Riser Type Mooring Without Sinkers - Class AA, BB, and CC
E2	e2_3.dxf	Free-Swinging, Riser-Type Mooring Without Sinkers - Class DD
E2	e2_3.pcx	Free-Swinging, Riser-Type Mooring Without Sinkers - Class DD
E2	e2_4.dxf	Free-Swinging, Riser-Type Mooring Without Sinkers - Class A, B, C, D, E, F, and G
E2	e2_4.pcx	Free-Swinging, Riser-Type Mooring Without Sinkers - Class A, B, C, D, E, F, and G
E2	e2_5.dxf	Free-Swinging, Riser-Type Mooring With Sinkers - Classes A, B, C, D, and E
E2	e2_5.pcx	Free-Swinging, Riser-Type Mooring With Sinkers - Classes A, B, C, D, and E
E3	e3_10.dxf	Tension Bar Mooring Buoy
E3	e3_10.pcx	Tension Bar Mooring Buoy
E3	e3_11.dxf	Hawsepiped Mooring Buoy
E3	e3_11.pcx	Hawsepiped Mooring Buoy
E3	e3_12.dxf	Tension Bar Mooring Buoy
E3	e3_12.pcx	Tension Bar Mooring Buoy
E3	e3_9.dxf	Standard Marker or Mooring Buoy
E3	e3_9.pcx	Standard Marker or Mooring Buoy
F1	f1.dxf	Recommended NAVMOOR Anchor Size for Navy Fleet Moorings
F1	f1.pcx	Recommended NAVMOOR Anchor Size for Navy Fleet Moorings
F	f10000.dxf	Plan View - 10K navmoor Anchor
F	f10000.pcx	Plan View - 10K navmoor Anchor
F	f12000.dxf	Anchor Assembly, Mooring NAVMOOR-10, 12000 Pounds
F	f12000.pcx	Anchor Assembly, Mooring NAVMOOR-10, 12000 Pounds
F	f18000.dxf	Anchor Assembly, Mooring NAVMOOR-15, 18000 Pounds
F	f18000.pcx	Anchor Assembly, Mooring NAVMOOR-15, 18000 Pounds
F	f2400.dxf	NAVMOOR-2 Mooring Anchor 2,400 lbs. (wt.) General Assembly
F	f2400.pcx	NAVMOOR-2 Mooring Anchor 2,400 lbs. (wt.) General Assembly
F	f2700.dxf	NAVMOOR-6 Salvage Anchor 7,200 lbs. (wt.) General Assembly
F	f2700.pcx	NAVMOOR-6 Salvage Anchor 7,200 lbs. (wt.) General Assembly
G1	g1.dxf	Common Wire Rope Construction Examples
G1	g1.pcx	Common Wire Rope Construction Examples
G2	g2.xls	Fiber Rope Specification
G3	g3.xls	Plain-Laid Rope Construction
G4	g4a.xls	Braided Rope Construction
G4	g4b.xls	Braided Rope Construction - Continued
H1	h1b.dxf	Driven Plate Anchor Configuration
H1	h1b.pcx	Driven Plate Anchor Configuration
H2	h2.dxf	Anchor-Follower Assembly
H2	h2.pcx	Anchor-Follower Assembly
I1	i1.dxf	Variation of Bollard Pull with Shaft Speed for ARS-38

MIL-HDBK-1026/4

		Class Ships
I1	i1.pcx	Variation of Bollard Pull with Shaft Speed for ARS-38 Class Ships
I2	i2.dxf	Variation of Bollard Pull with Shaft Speed and Propeller Pitch for ARS-50 Class Ships
I2	i2.pcx	Variation of Bollard Pull with Shaft Speed and Propeller Pitch for ARS-50 Class Ships
I3	i3.dxf	Bollard Pull vs. Shaft Speed and Propeller Pitch For T-ATF-169 Class Ship Without Kort Nozzle
I3	i3.pcx	Bollard Pull vs. Shaft Speed and Propeller Pitch For T-ATF-169 Class Ship Without Kort Nozzle
J1	j1.dxf	Chocks for Nylon Rope
J1	j1.pcx	Chocks for Nylon Rope
J2	j2.dxf	Bitts for Nylon Rope
J2	j2.pcx	Bitts for Nylon Rope
J3	j3.dxf	Vertical Howser Reels
J3	j3.pcx	Vertical Howser Reels
J4	j4.dxf	Horizontal Hawser Reels
J4	j4.pcx	Horizontal Hawser Reels
J5	j5.dxf	Capstan Head Sizes for Nylon Ropes
J5	j5.pcx	Capstan Head Sizes for Nylon Ropes
J6	j6_54.xls	Three-Strand Nylon Rope
J6	j6_55.xls	Plaited Nylon
J6	j6_56.xls	Double Braided Nylon Rope
J6	j6_57.xls	Plaited Continuous Polyester Filament with Staple Wrap & Three-Strand Polyester
J6	j6_58.xls	Three-Strand Polypropylene & Double Braided Polyester Filament With Staple Wrap
J6	j6_59.xls	Three-Strand Dual Fiber & Plaited Dual Fiber
J7	j7.xls	Minimum Number of Lines Used in Preliminary Mooring Analysis
K1	k1.dxf	U.S. Navy Stockless Anchor
K1	k1.pcx	U.S. Navy Stockless Anchor

TABLE 2
Capacity of Standard Navy Fleet Moorings
(Riser-Type)

Class	Previous Class	Moorings Capacity (pounds)	Number of Ground Legs	Riser Chain Diameter (inches)	Type of Chain Throughout
AA	A-A	300,000	3 (Twin chain)	4	U.S. Navy Common A-Link
BB	B-B	250,000	3 (Twin chain)	3-1/2	U.S. Navy Common A-Link
CC	C-C	200,000	3 (Twin chain)	3-1/2	U.S. Navy Common A-Link
DD	D-D	175,000	3 (Single chain)	3	U.S. Navy Common A-Link
A	A	150,000	3 (Single chain)	2-3/4	U.S. Navy Common A-Link
B	B	125,000	3 (Single chain)	2-1/2	U.S. Navy Common A-Link
C	C	100,000	3 (Single chain)	2-1/4	U.S. Navy Common A-Link
D	D	75,000	3 (Single chain)	2	U.S. Navy Common A-Link
E	E	50,000	3 (Single chain)	1-3/4	U.S. Navy Common A-Link
F	F	25,000	3 (Single chain)	1-1/4	U.S. Navy Common A-Link
G	G	5,000	3 (Single chain)	3/4	U.S. Navy Common A-Link

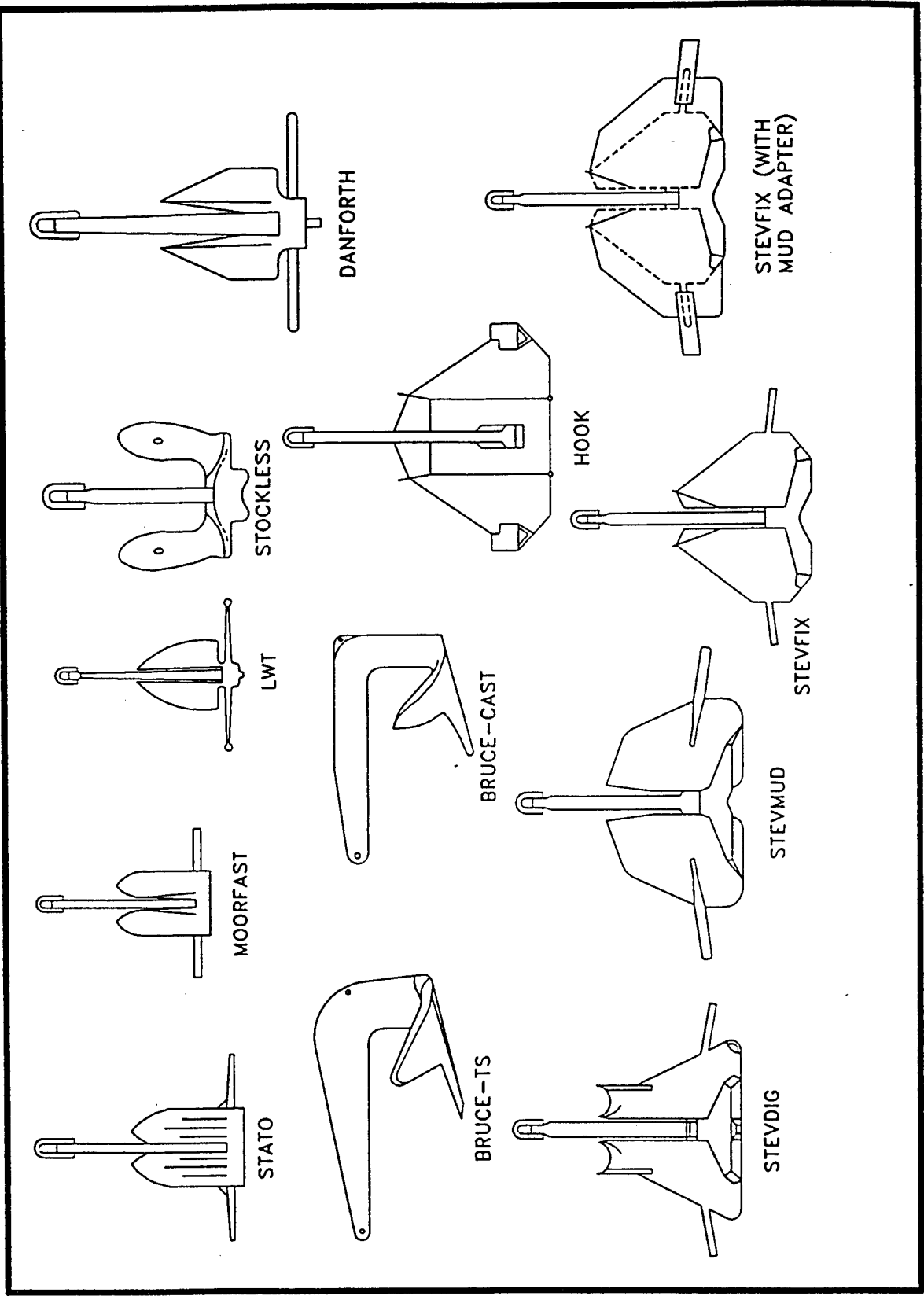


FIGURE 14
Types of Drag-Embedment Anchors

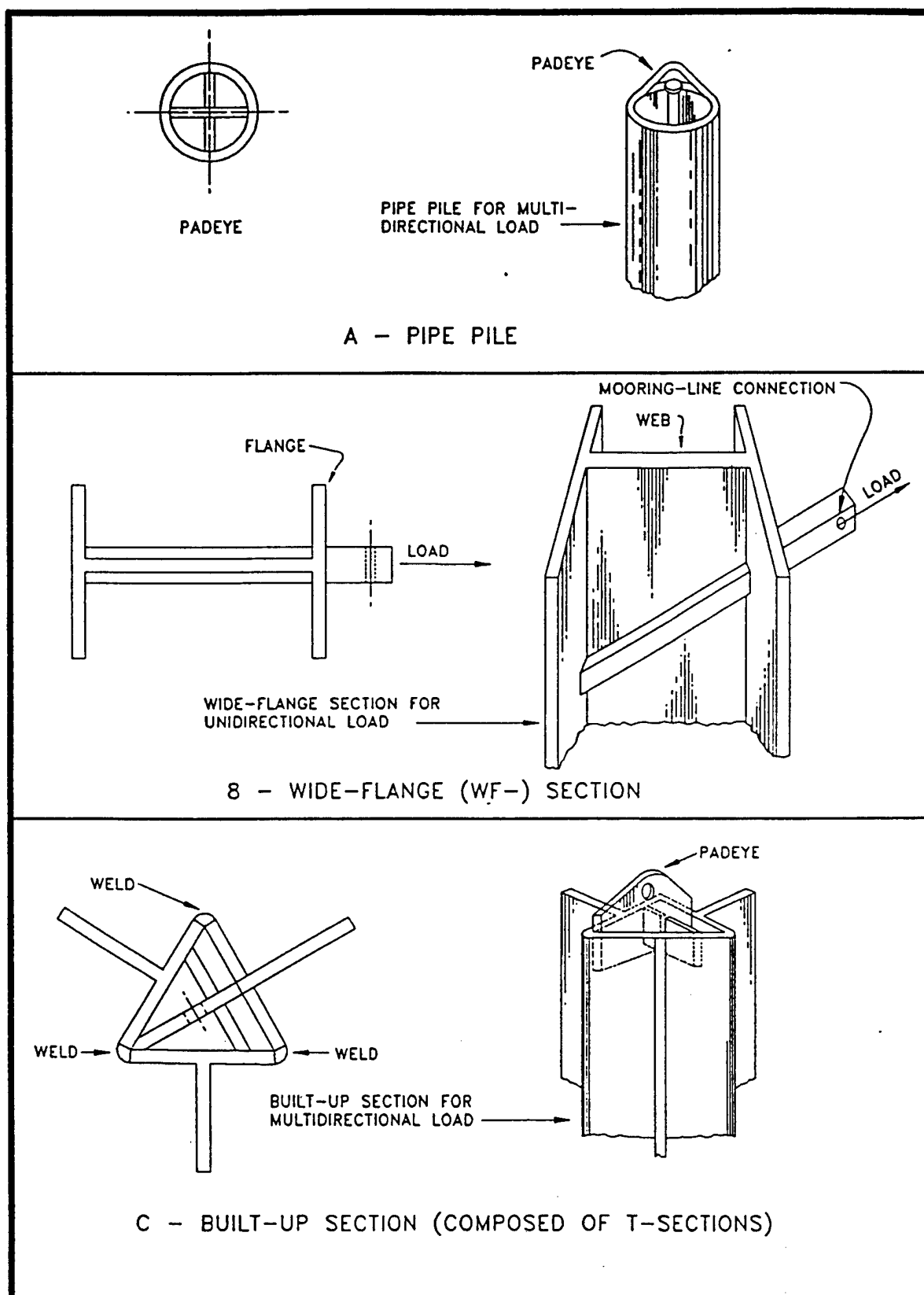
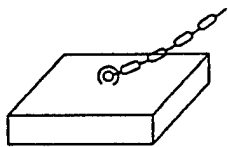
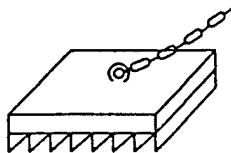


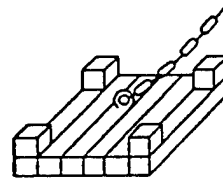
FIGURE 16
Types of Pile Anchors



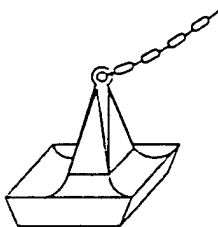
SQUAT CLUMP



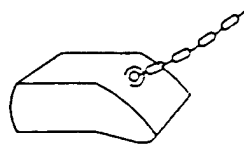
CONCRETE SLAB WITH
SHEAR KEYS



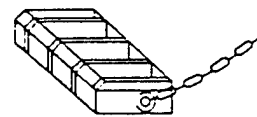
OPEN FRAME WITH
WEIGHTED CORNERS



MUSHROOM



WEDGE
OR
PEARL HARBOR



SLANTED SKIRT

FIGURE 16
Types of Deadweight Anchors

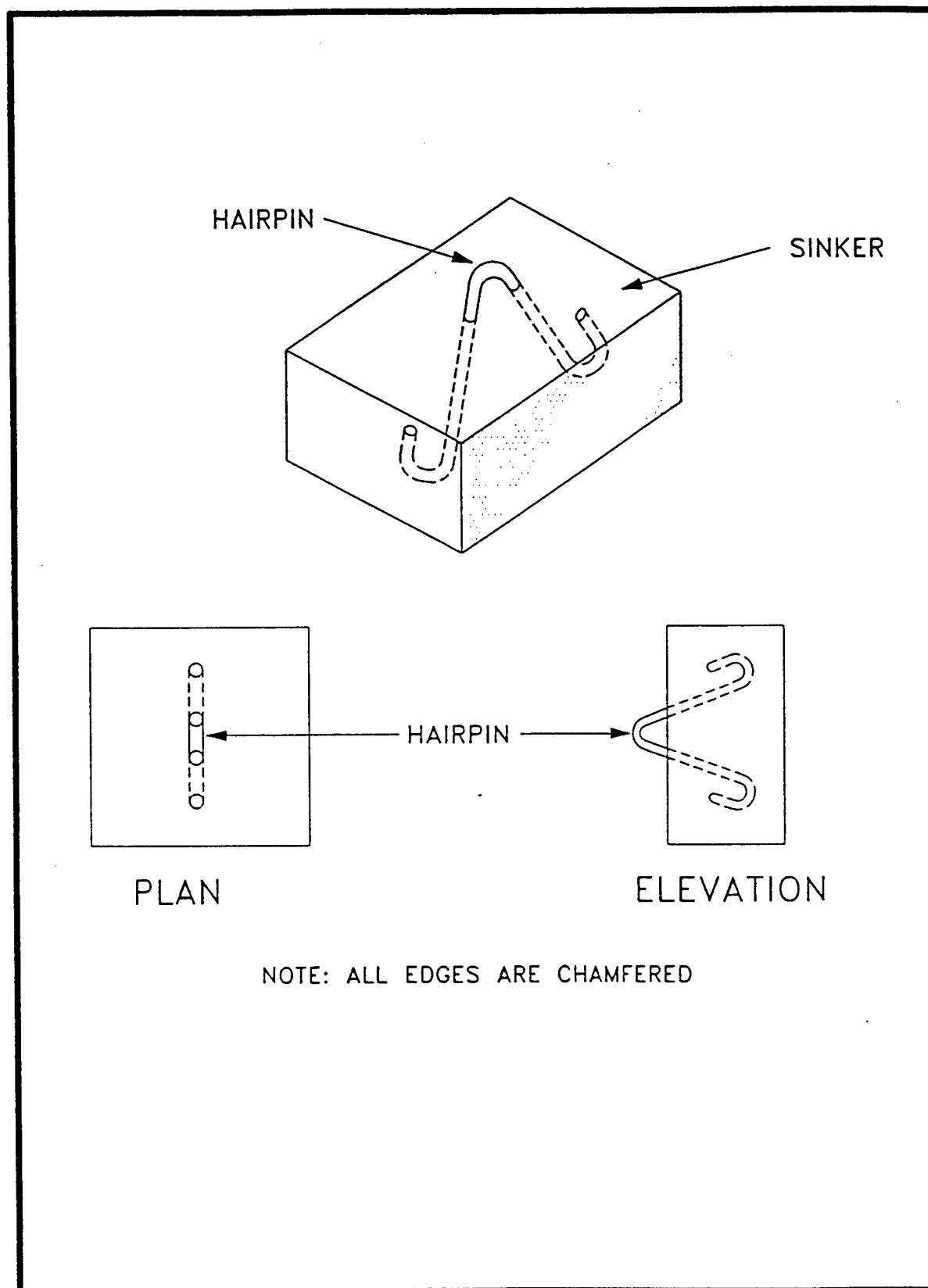


FIGURE 24
Concrete Sinker Used in Standard Navy Moorings

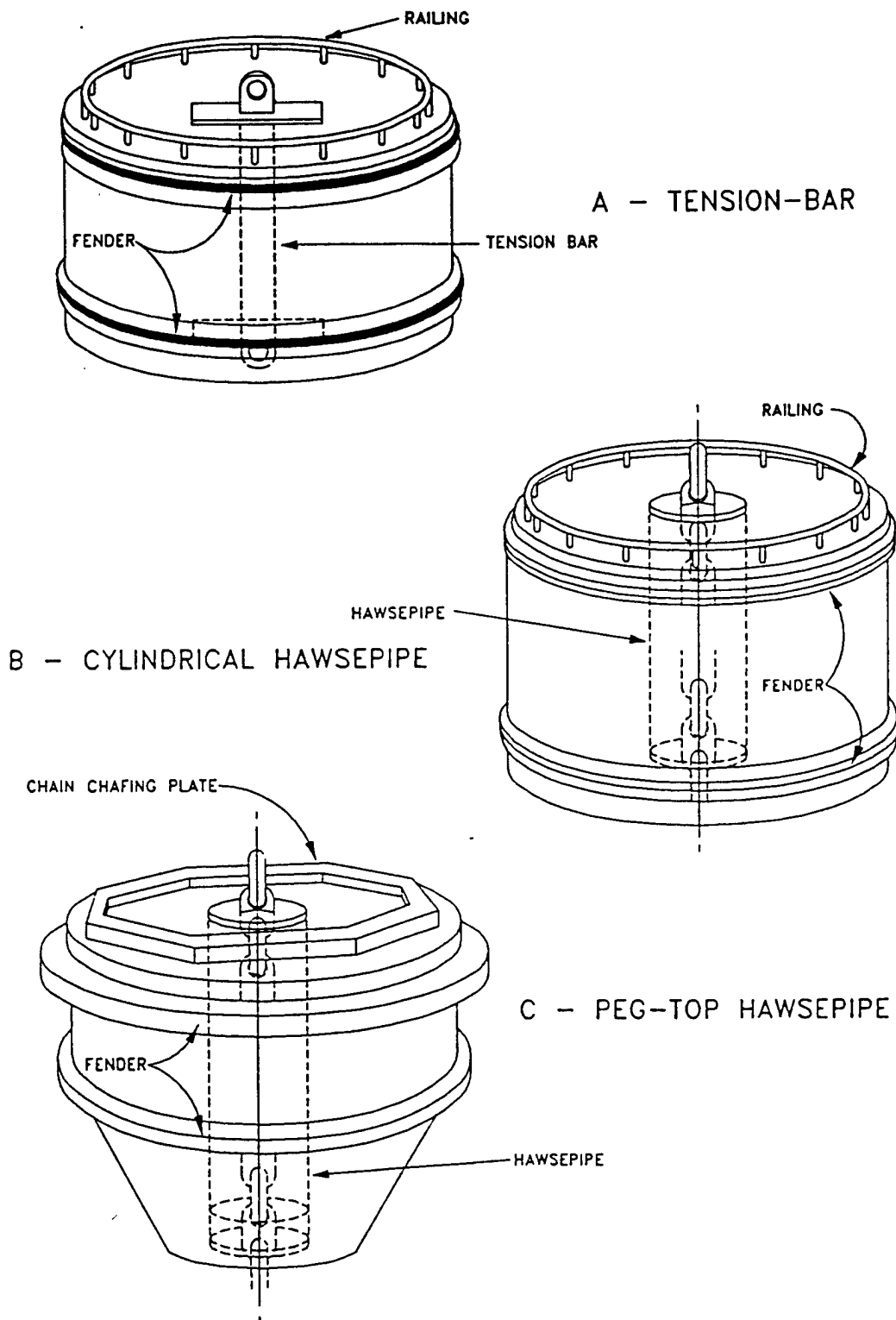


FIGURE 36
Riser-Type Buoys

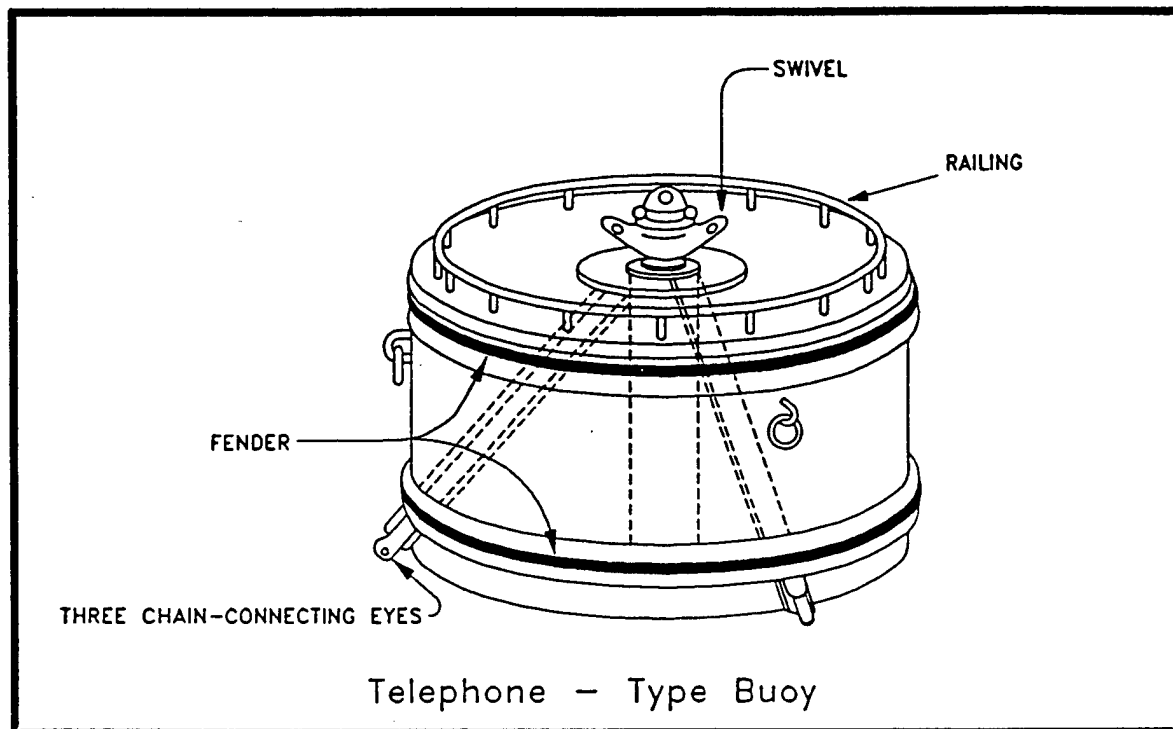


FIGURE 37
Telephone-Type Buoy

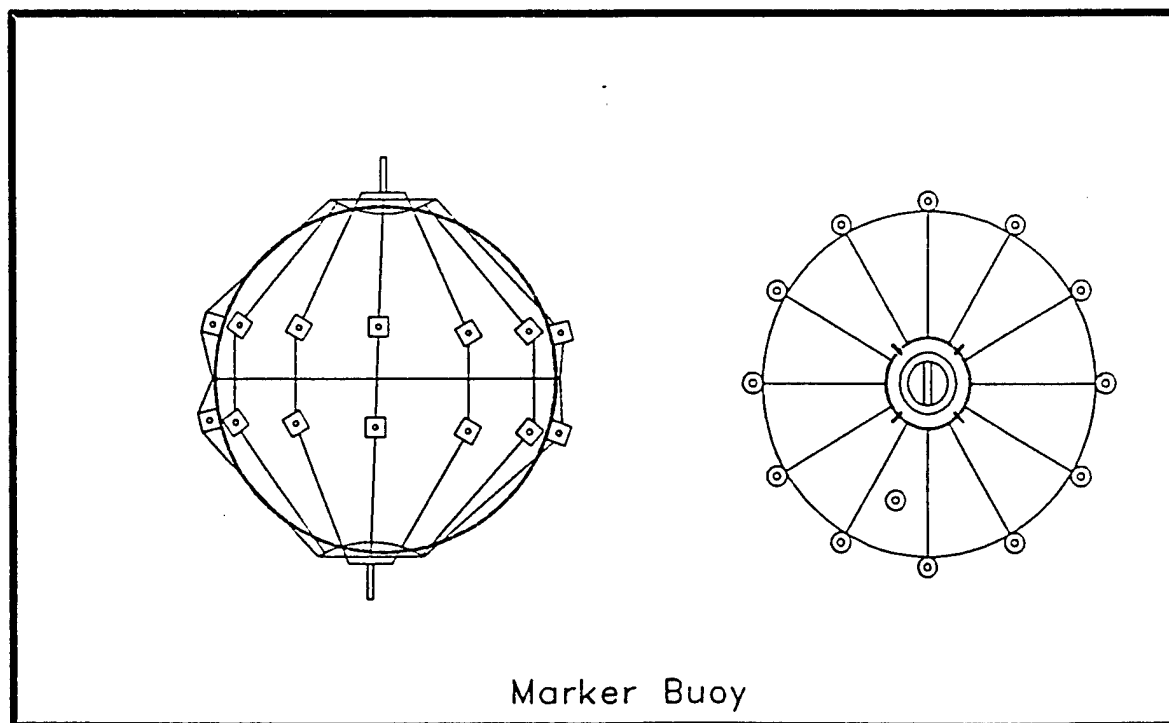
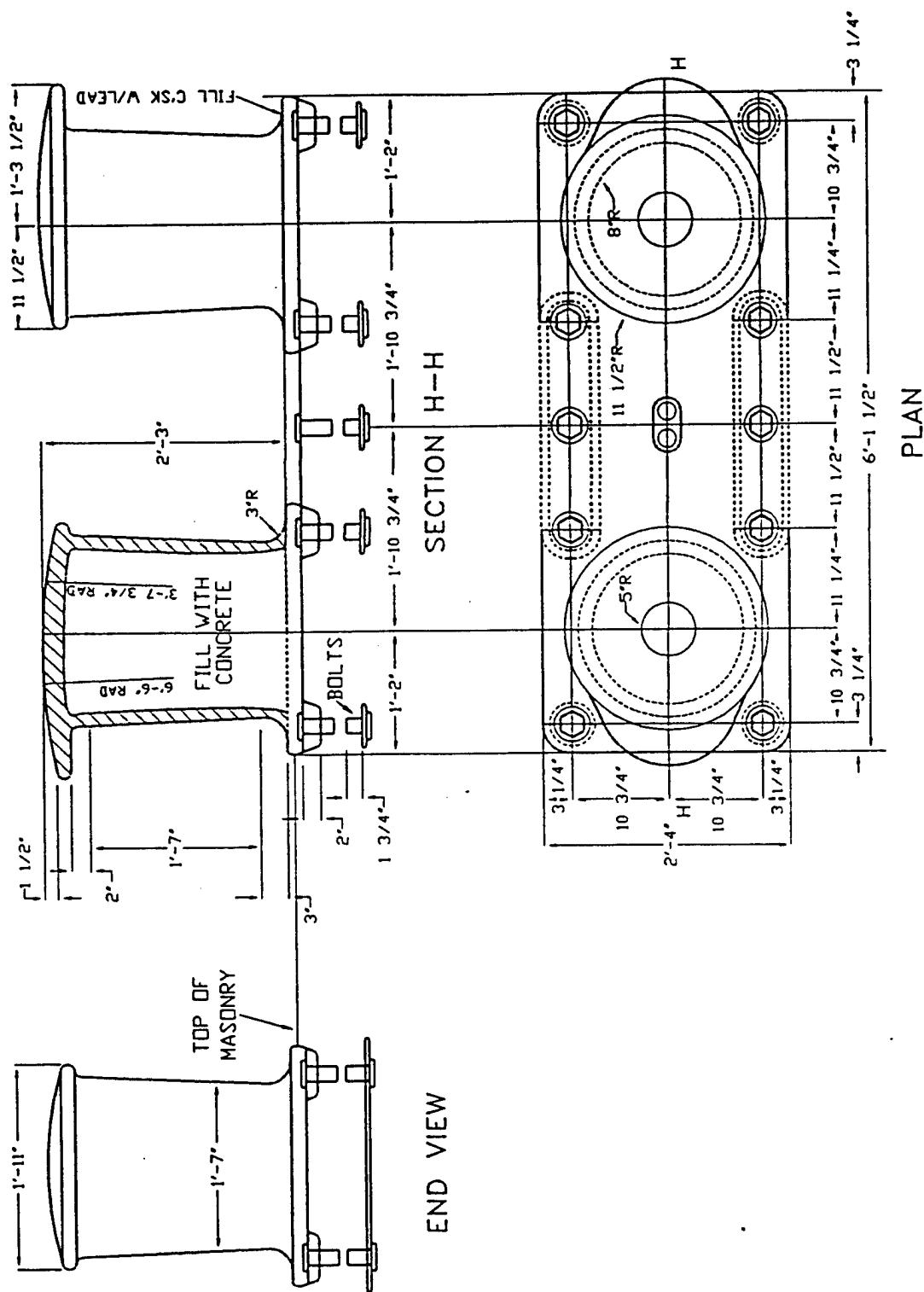
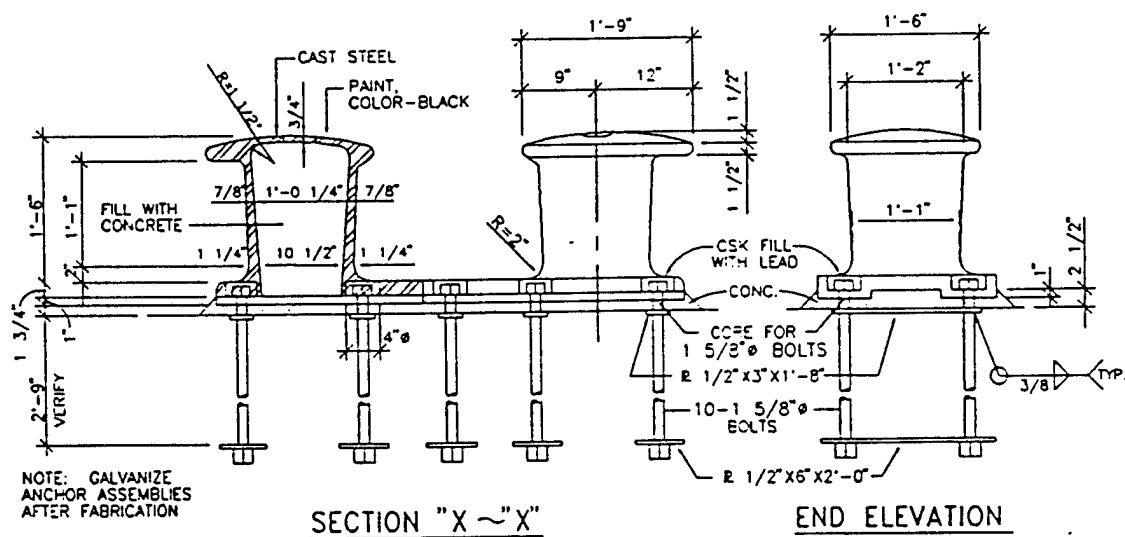
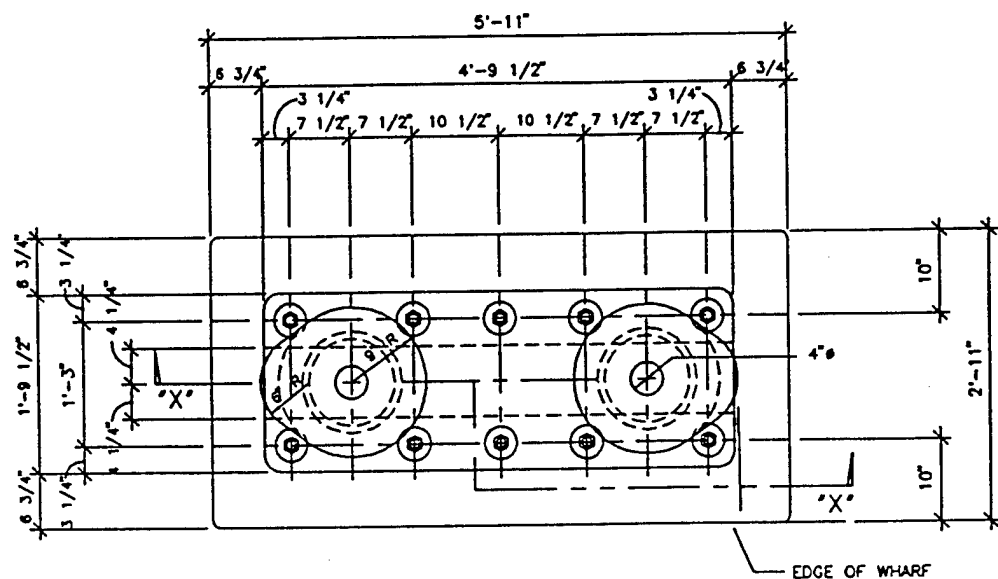


FIGURE 38
Marker Buoy

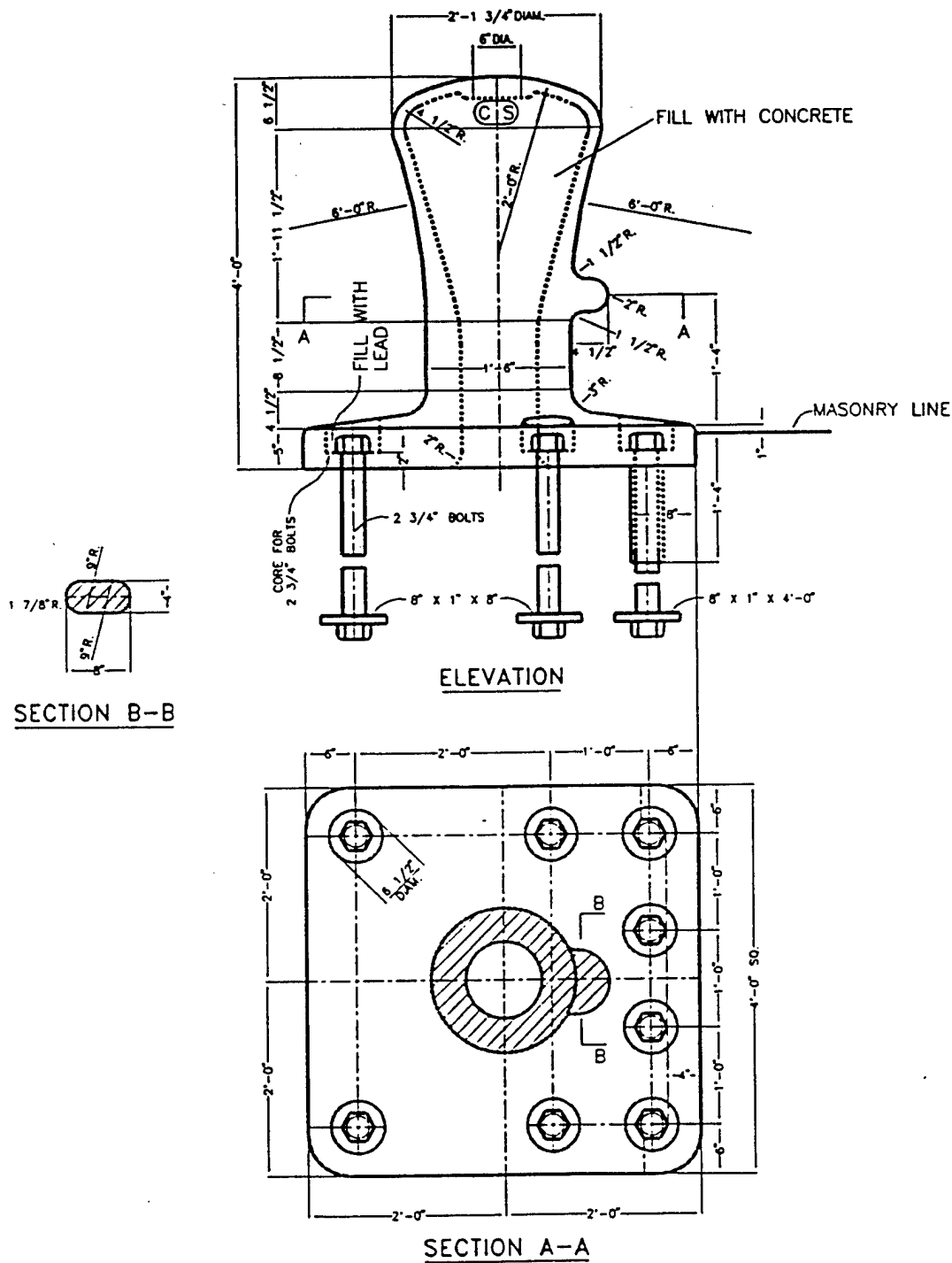




DOUBLE BITT, MEDIUM CAST STEEL
RATED CAPACITY: 61 TONS @ HORIZ.
37 TONS @ 45°

Low Double Bitt With Lip

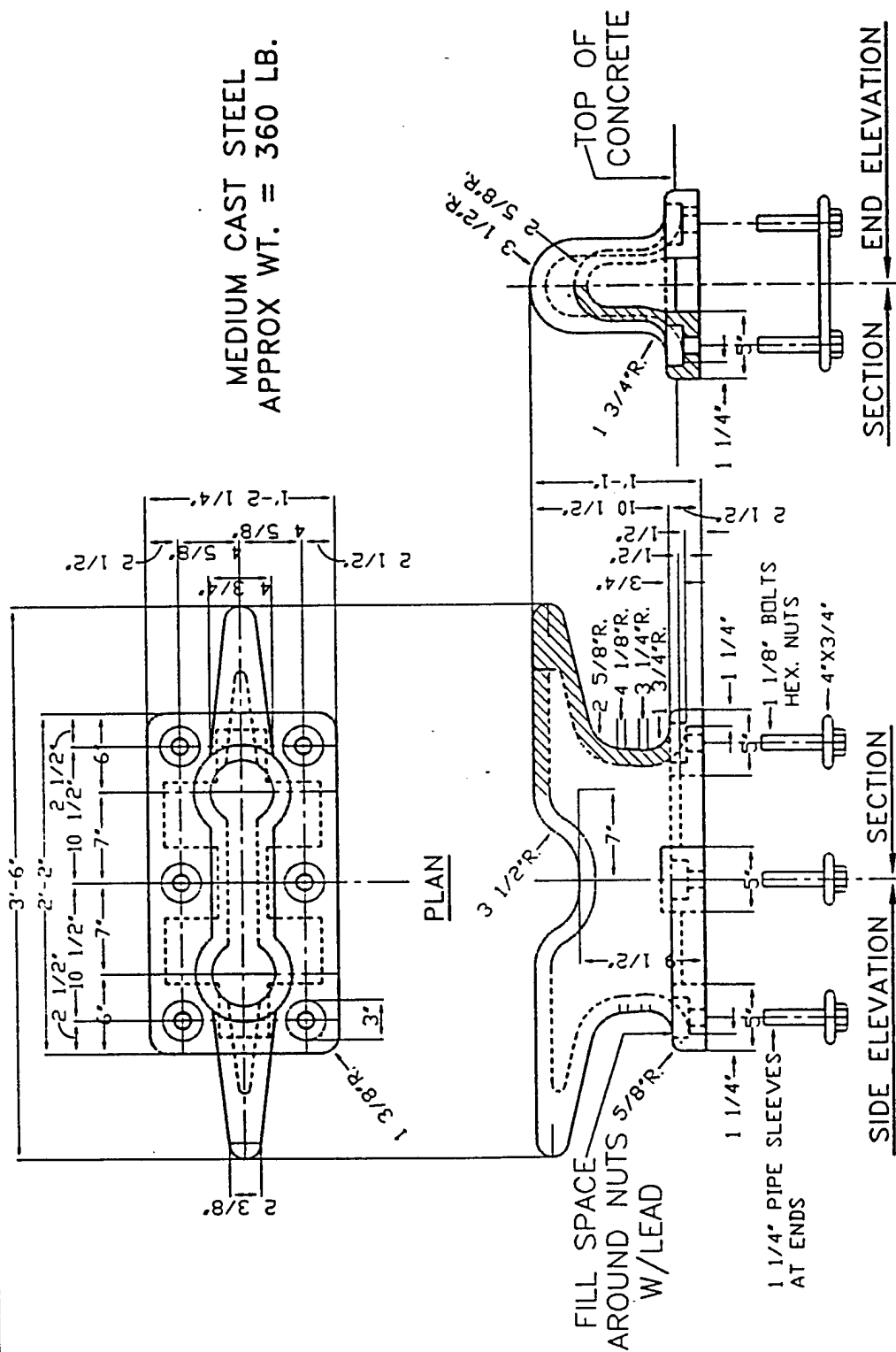
CAPACITY 60000 LB (NOM)
WEIGHT 1425 LB



Special Mooring Bollard "A"

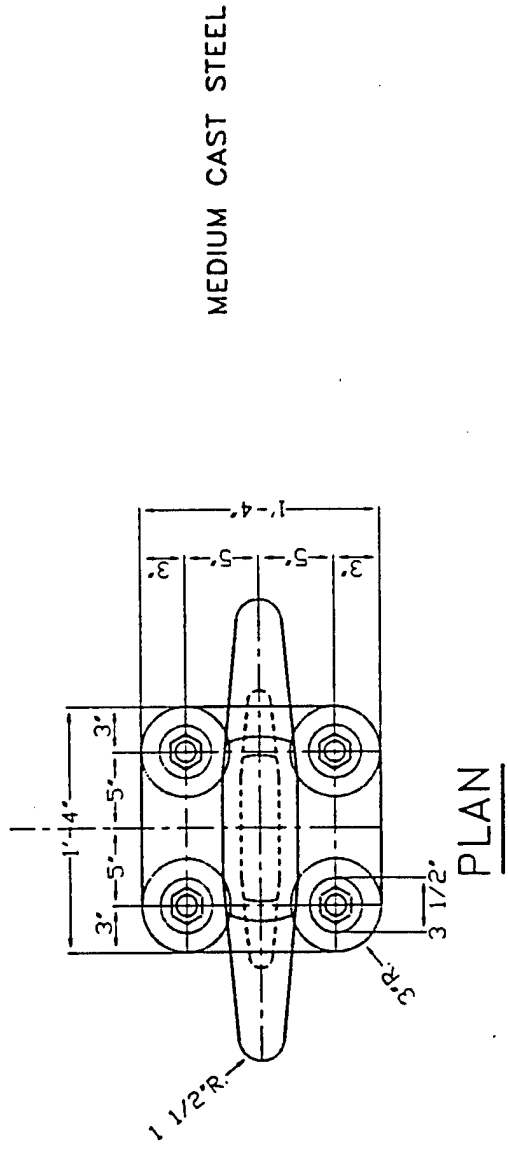
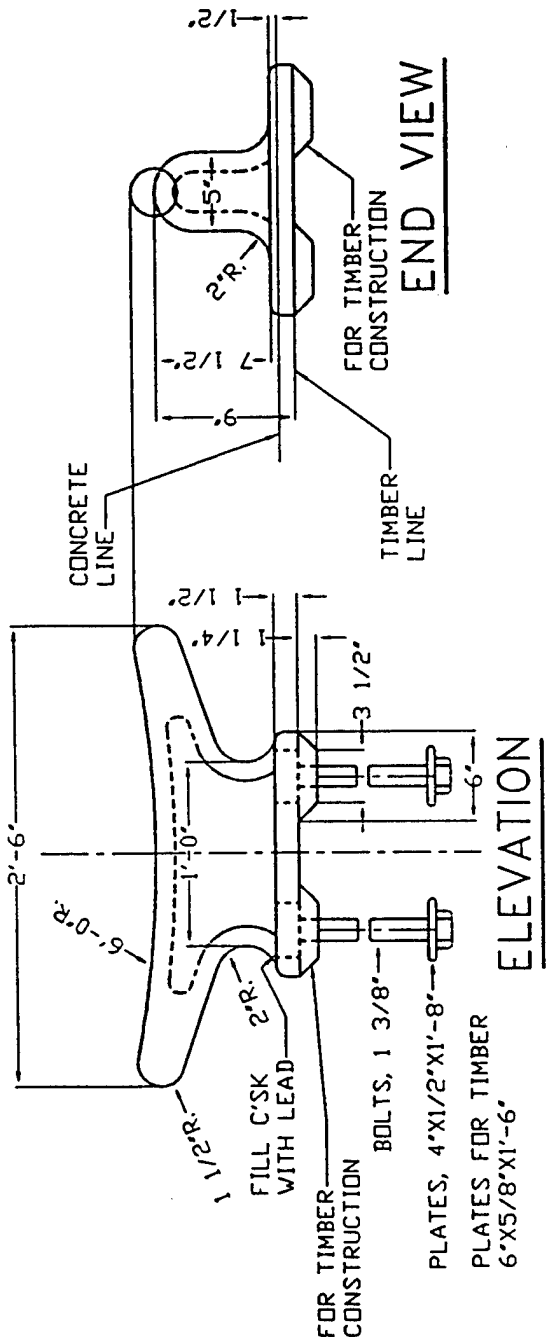
CAPACITY 450000 LB (NOM)

WEIGHT 5620 LB



42" Cleat
CAPACITY 40000LB(NOM)

CAPACITY



30" Cleft
 CAPACITY 20000 LB (NUM)

(All Dimensions in Inches)

Nominal Diameter	A (min)	A (max)	B (min)	C (min)	C (max)	D (min)	E (min)	E (max)	F (min)	G (min)	H (max)
1-3/4	10.50	10.76	2.62	1.75	1.81	1.69	6.21	6.50	1.50	1.41	1.58
2	12.00	12.30	3.00	2.00	2.06	1.94	7.10	7.37	1.65	1.59	1.77
2-1/4	13.50	13.84	3.42	2.25	2.34	2.19	8.04	8.35	1.80	1.59	2.09
2-1/2	15.00	15.38	3.76	2.50	2.59	2.44	8.88	9.20	1.95	1.64	2.23
2-3/4	16.50	16.91	4.12	2.75	2.84	2.79	9.76	10.18	2.10	1.80	2.48
3	18.00	18.45	4.49	3.00	3.09	2.94	10.65	11.05	2.25	1.94	2.62
3-1/2	21.00	21.53	5.25	3.50	3.59	3.38	12.43	12.81	2.40	2.38	3.12
4	24.00	24.60	6.20	4.00	4.10	3.88	14.40	14.78	2.70	2.58	3.58

Note: 'C' dimension is tolerance range for bar stock
'D' dimension is minimum bar diameter at crown
'E' dimension does not include flashing at weld

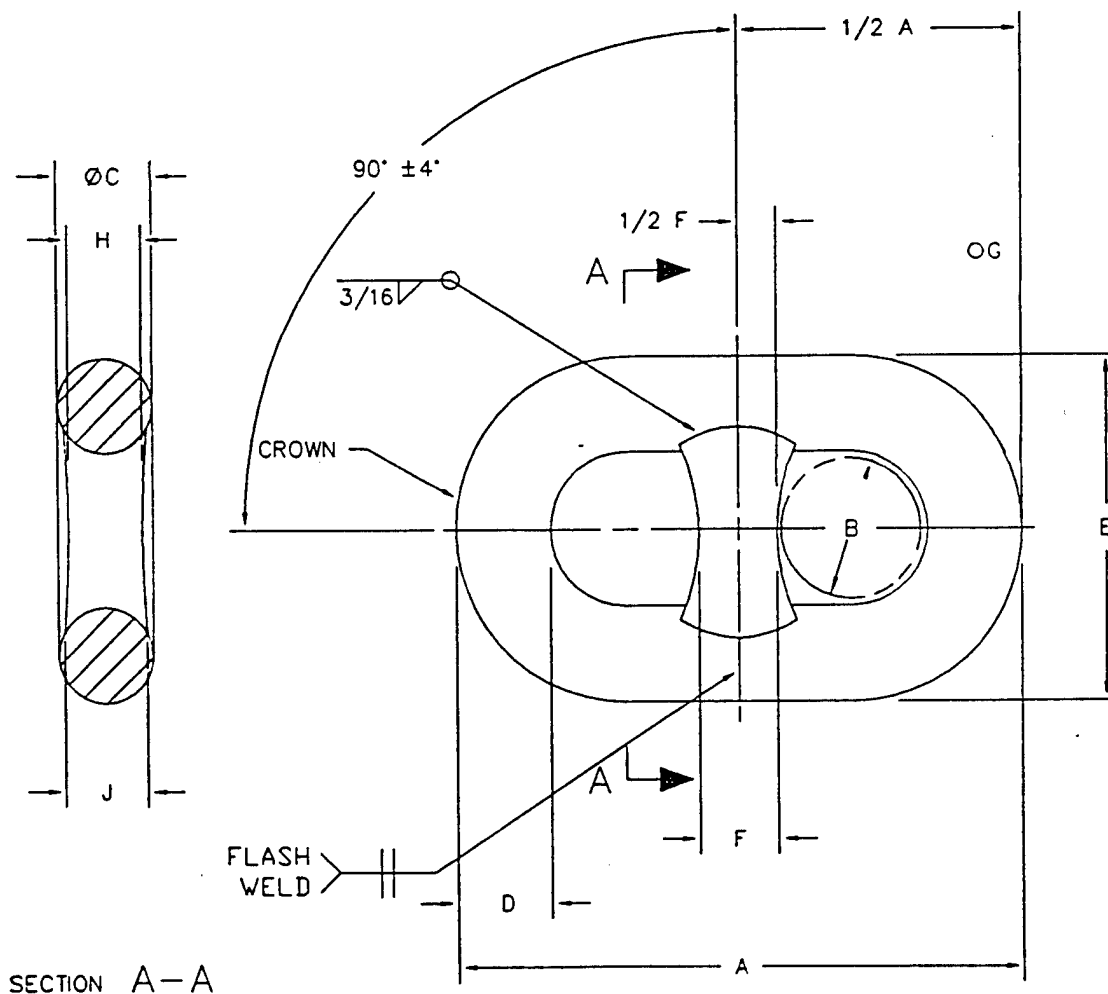


FIGURE 1A
Common Stud Link Chain

(All Dimensions in Inches)

Nominal Diameter	A (min)	A (max)	B (min)	B (max)	C (min)	C (max)	D (min)	D (max)	E (min)	E (max)	F (min)	F (max)	G (min)	G (max)
1-3/4	11.97	12.03	7.72	7.78	2.33	2.61	1.97	2.03	2.34	2.47	2.47	2.53	1.30	1.33
2	13.47	13.53	8.69	8.75	2.61	2.95	2.22	2.28	2.65	2.78	2.78	2.84	1.45	1.51
2-1/4	14.79	15.03	9.65	9.72	2.90	3.28	2.47	2.53	2.91	3.06	3.06	3.12	1.64	1.67
2-1/2	16.47	16.53	10.78	10.84	3.59	4.03	2.84	2.90	3.25	3.30	3.44	3.50	1.80	1.83
2-3/4	18.34	18.41	11.98	12.03	3.97	4.47	3.16	3.22	3.34	3.40	3.81	3.87	1.89	1.92
3	19.72	19.78	12.84	12.91	4.38	4.62	3.34	3.40	3.47	3.63	4.06	4.17	2.11	2.18
3-1/2	23.22	23.28	14.97	15.03	4.67	5.26	3.84	3.90	4.58	4.72	4.72	4.78	2.61	2.64
4	25.40	25.60	17.34	17.40	6.33	6.67	4.34	4.40	5.22	5.38	5.84	5.91	2.87	2.91

Note:
All Chain Joining Links
Must Be Compatible With
The Common Stud Link Of
The Same Nominal Size

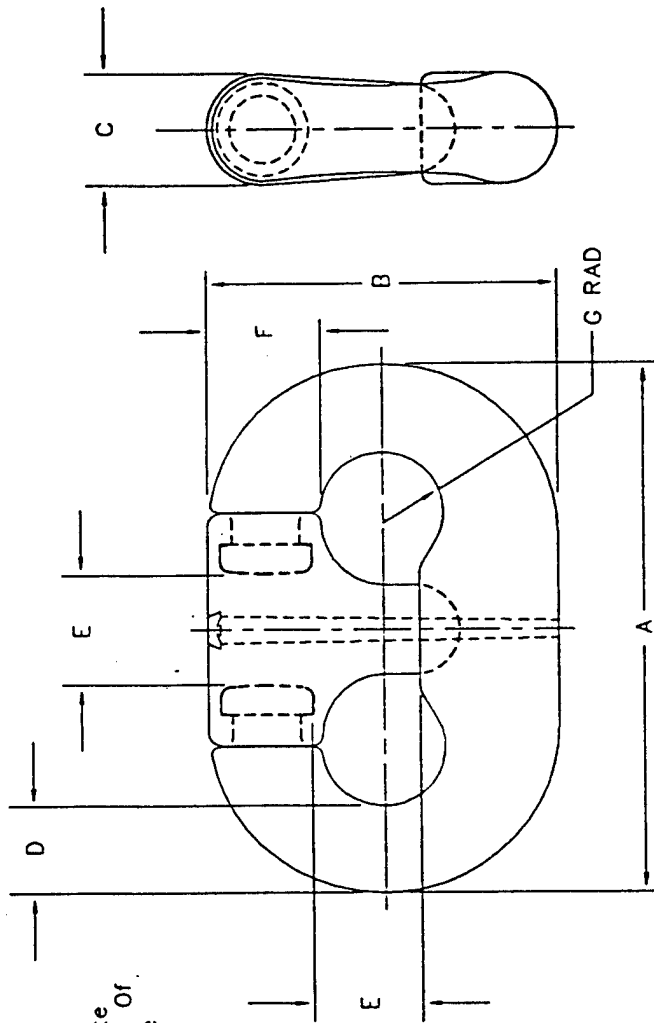
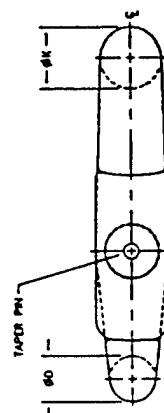
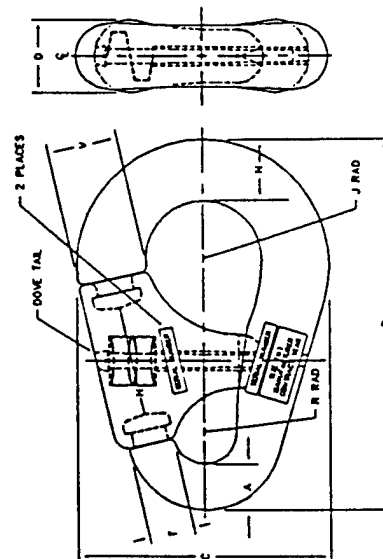


FIGURE 2
Chain Joining Link

(All Dimensions In Inches)

Nominal Diameter	A (min)	A (max)	B (min)	B (max)	C (min)	C (max)	D (min)	D (max)	H (min)	H (max)	J (min)	J (max)
1-3/4	1.97	2.03	14.84	14.90	10.22	10.28	3.00	3.18	3.91	3.97	2.05	2.08
2	2.34	2.41	17.84	17.90	12.28	12.34	3.62	3.86	4.72	4.78	2.51	2.54
2-1/4	3.09	3.15	22.09	22.15	14.78	14.84	4.75	5.03	5.84	5.91	2.98	3.01
2-1/2	3.09	3.15	22.09	22.15	14.78	14.84	4.75	5.03	5.84	5.91	2.98	3.01
2-3/4	3.09	3.15	22.09	22.15	14.78	14.84	4.75	5.03	5.84	5.91	2.98	3.01
3	3.59	3.66	25.72	25.78	16.47	16.53	5.25	5.57	6.06	6.17	3.11	3.14
3-1/2	3.59	3.66	25.72	25.78	16.47	16.53	5.25	5.57	6.06	6.17	3.11	3.14
4	4.87	5.12	36.77	37.23	23.75	24.25	7.87	8.12	7.87	8.12	4.25	4.50

Nominal Diameter	N (min)	N (max)	R (min)	R (max)	T (min)	T (max)	V (min)	V (max)
1-3/4	2.47	2.53	1.23	1.26	2.22 X 2.34	2.38 X 2.41	2.87	2.94
2	2.97	3.03	1.45	1.48	2.41 X 2.84	2.47 X 2.91	3.44	3.50
2-1/4	3.72	3.78	1.89	1.92	3.09 X 3.34	3.15 X 3.41	4.34	4.41
2-1/2	3.72	3.78	1.89	1.92	3.09 X 3.34	3.15 X 3.41	4.34	4.41
2-3/4	3.72	3.78	1.89	1.92	3.09 X 3.34	3.15 X 3.41	4.34	4.41
3	4.67	5.06	2.11	2.14	3.97 X 4.34	4.03 X 4.41	5.09 X 5.22	5.16 X 5.28
3-1/2	4.64	5.06	2.11	2.14	3.97 X 4.34	4.03 X 4.41	5.09 X 5.22	5.16 X 5.28
4	6.68	7.06	2.95	3.06	6.00	6.16	7.68	8.06



Note: All Anchor Joining Links Must Fit The Common Stud Link and the Ground Ring of the Same Nominal Size. 2-1/4 to 2-3/4 Inch Anchor Joining Links Shall be Tested to the 2-3/4 Inch Requirements and Marked With The Range of 2-1/4 to 2-3/4 Inches. Same Requirement for 3 and 3-1/2 Inch Sizes.

FIGURE 3
Anchor Joining Link

(All Dimensions in Inches)

Nominal Diameter	A (min)	A (max)	B (min)	B (max)
1-3/4	3.41	3.59	8.78	9.23
2	3.66	3.84	10.24	10.76
2-1/4	5.25	5.50	11.70	12.30
2-1/2	5.25	5.50	11.70	12.30
2-3/4	5.25	5.50	11.70	12.30
3	5.50	5.75	13.16	13.84
3-1/2	5.75	6.00	13.16	13.84
4	7.31	7.69	19.00	19.95

NOTE:

- 2-1/4 to 2-3/4 inch Ground Rings shall be tested to the 2-3/4 inch requirements and marked with the range of 2-1/4 to 2-3/4.
- Markings shall be as specified in Section 3.8.

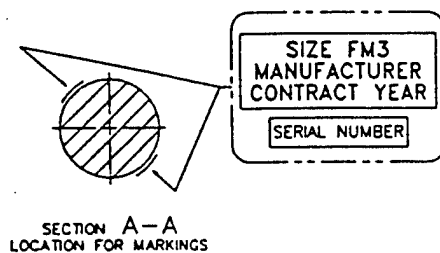
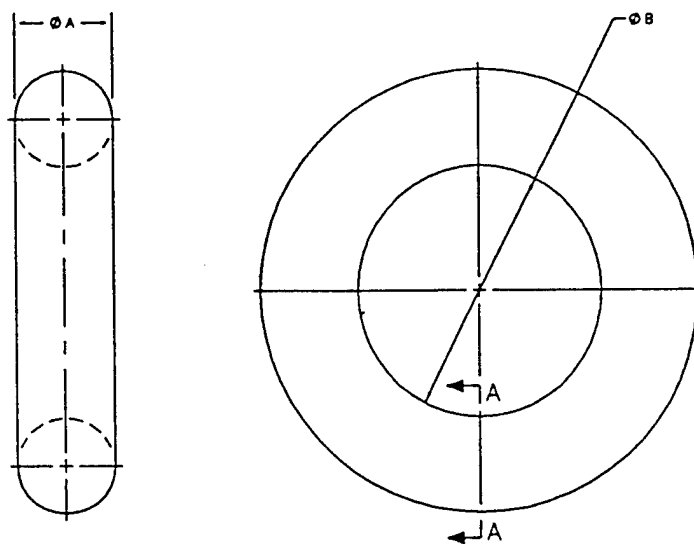


FIGURE 4
Ground Ring

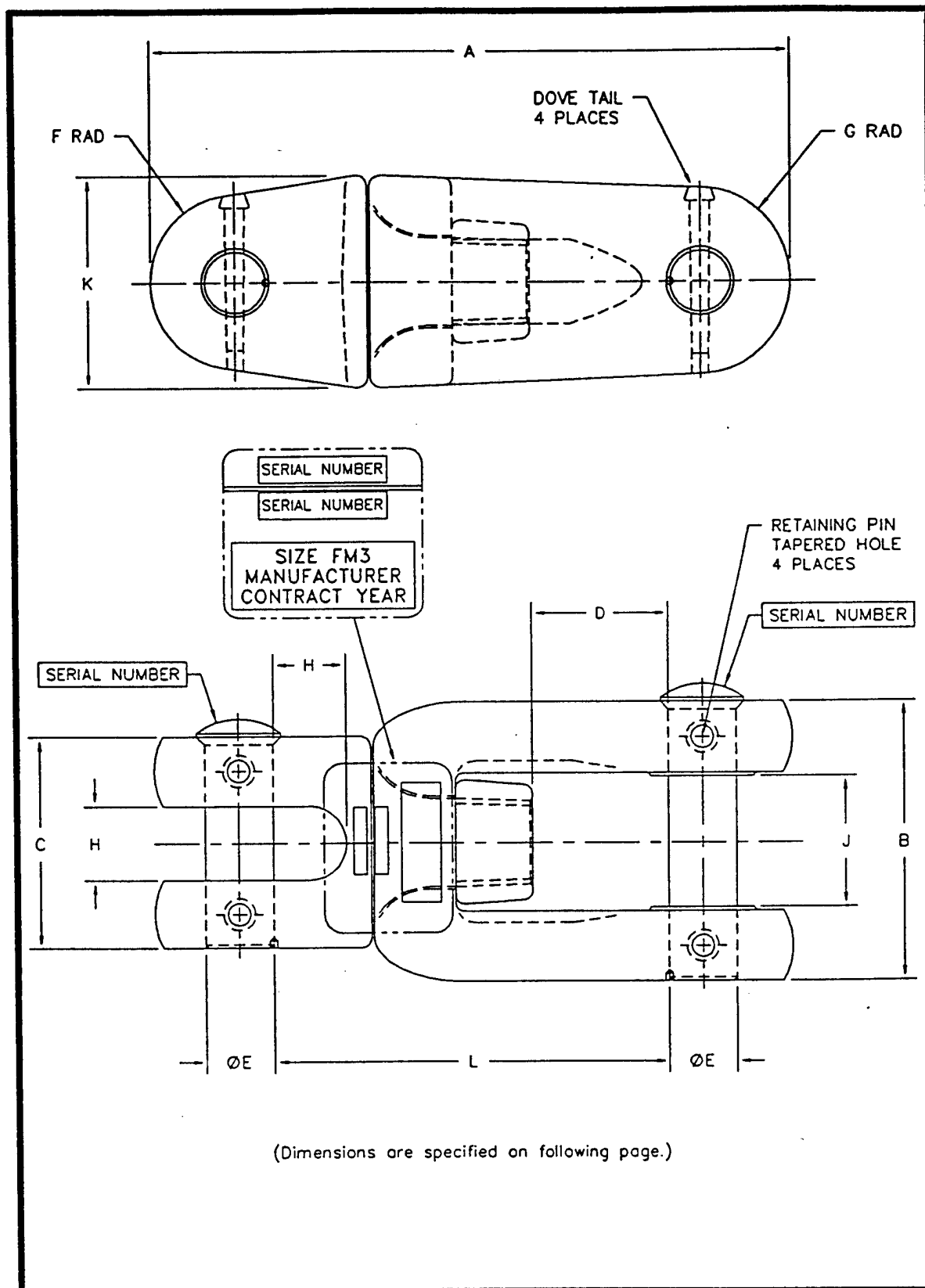


FIGURE 5
Swivel Shackle (Page 1 of 2)

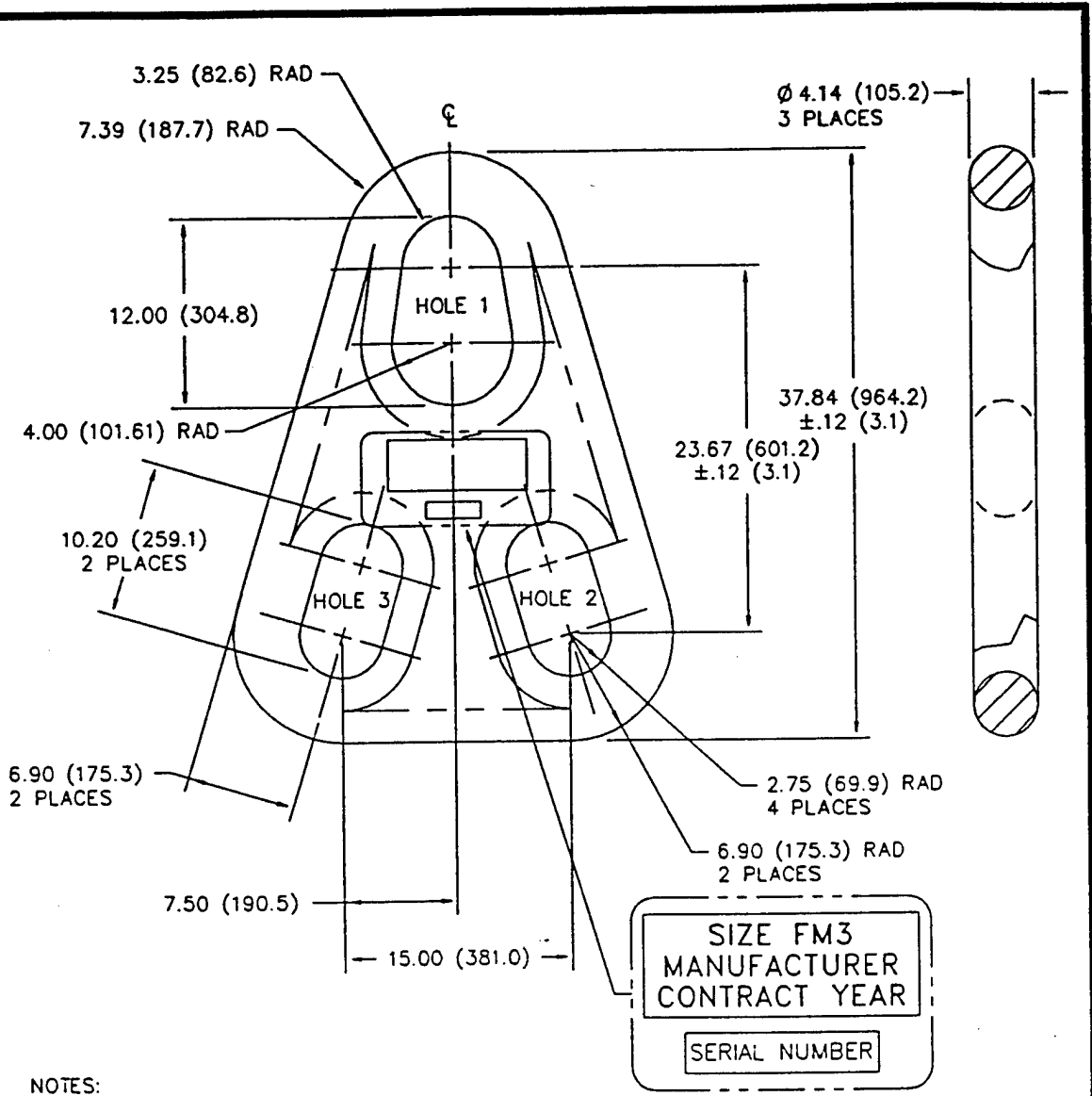
(All Dimensions In Inches)

Nominal Diameter	A (min)	A (max)	B (min)	B (max)	C (min)	C (max)	D (min)	E (min)	E (max)	F (min)	F (max)
1-3/4	20.91	22.44	9.07	9.53	6.83	7.18	5.62	2.22	2.34	2.80	2.94
2	25.36	26.66	11.21	11.79	7.99	8.39	5.62	2.57	2.71	3.29	3.45
2-1/4	27.44	30.50	12.29	12.92	8.76	9.20	8.00	2.84	2.98	3.61	3.79
2-1/2	31.89	33.53	13.74	14.44	9.83	10.32	8.00	3.23	3.39	4.07	4.27
2-3/4	34.09	35.83	15.04	15.82	10.74	11.30	8.00	3.23	3.39	4.42	4.64
3	38.74	40.72	16.43	17.27	12.05	12.67	9.00	3.76	3.96	4.99	5.25
3-1/2	45.90	48.26	19.34	20.34	13.82	14.52	9.00	4.45	4.67	5.53	5.81
4	52.11	54.79	21.96	23.08	15.74	16.54	9.00	4.62	4.87	6.44	6.78

Nominal Diameter	G (min)	G (max)	H (min)	H (max)	J (min)	J (max)	K (min)	K (max)	P (min)	P (max)
1-3/4	2.99	3.15	2.38	2.50	3.75	4.87	6.83	7.18	12.90	14.75
2	3.69	3.87	2.76	2.90	3.75	4.87	7.99	8.39	15.81	16.63
2-1/4	4.03	4.23	3.07	3.23	3.75	4.87	8.76	9.20	16.97	19.56
2-1/2	4.56	4.80	3.45	3.63	3.75	4.87	9.83	10.33	20.04	21.06
2-3/4	4.95	5.21	3.76	3.96	3.75	4.87	10.74	11.30	21.22	22.31
3	6.03	6.33	4.07	4.27	3.75	4.87	12.05	12.67	23.96	25.18
3-1/2	6.30	6.62	4.84	5.08	3.75	4.87	13.82	14.52	29.63	31.15
4	7.22	7.59	5.53	5.81	3.75	4.87	15.74	16.54	33.39	35.11

Note: Pin diameter to hole diameter looseness shall be +.090 max. for sizes 2-1/2, 2-3/4, 3, 3-1/2, 4, and +.072 max. for sizes 2 1/4, 2, 1 3/4.

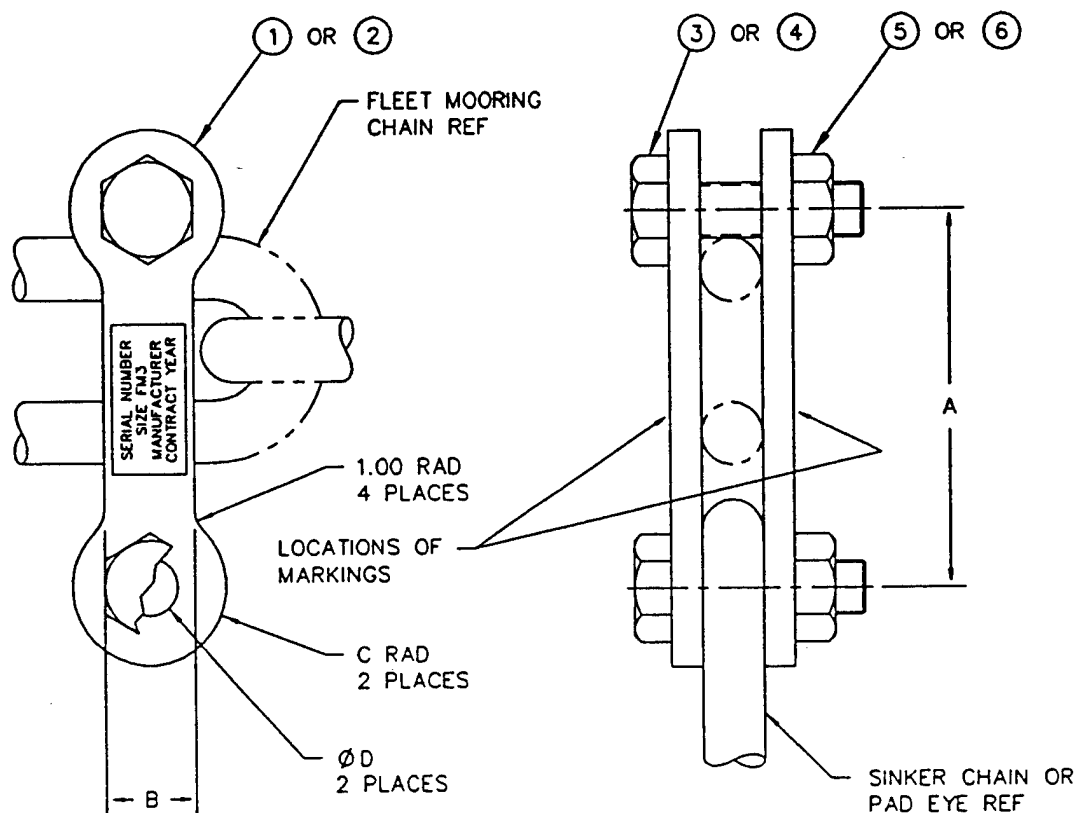
FIGURE 5
Swivel Shackle (Page 2 of 2)



NOTES:

1. HOLE 1 SHALL FIT THE SMALL END OF 3.50 AND 4.00 INCH NOMINAL SIZE ANCHOR JOINING LINKS.
2. HOLES 2 AND 3 SHALL FIT THE LARGE END OF 2.25, 2.50 AND 2.75 INCH NOMINAL SIZE ANCHOR JOINING LINKS.
3. ALL HOLES SHALL MEET THE PROOF AND BREAK LOAD REQUIREMENTS OF 4.00 CHAIN.
4. MARKINGS SHALL BE AS SPECIFIED IN SECTION 3.7.
5. ALLOWABLE DIMENSIONAL TOLERANCES SHALL BE $-.06 +.12$ UNLESS NOTED.
6. ALL DIMENSIONS ARE IN INCHES AND (CENTIMETERS).

FIGURE 6
Spider Plate



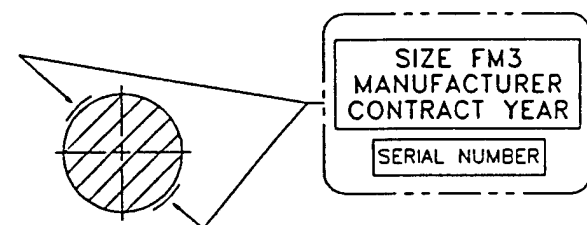
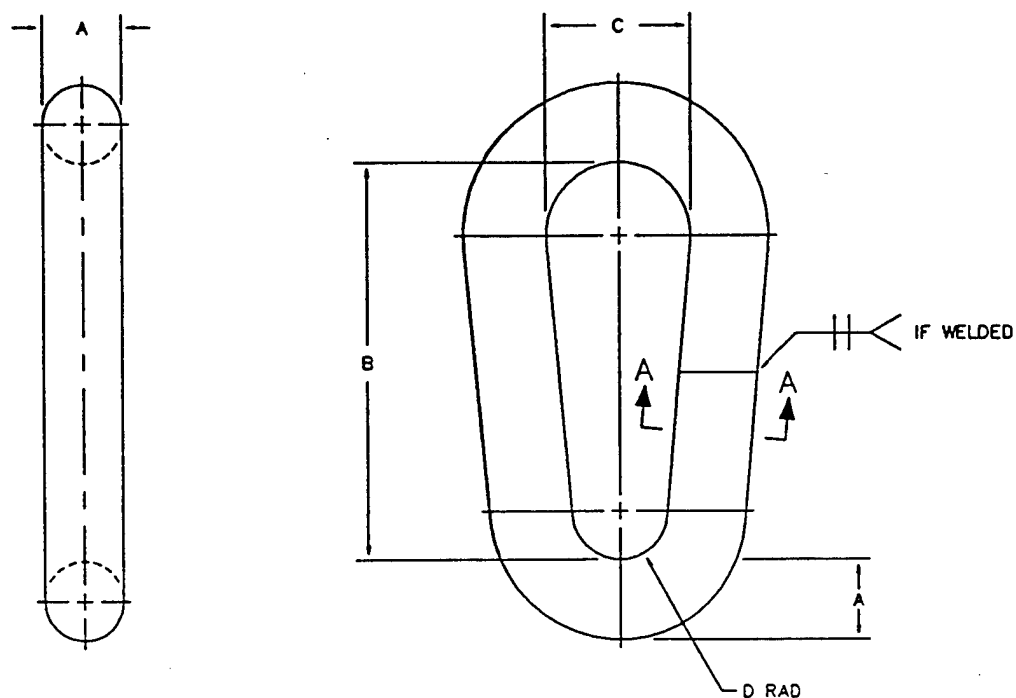
DASH NO.	SINKER CHAIN OR PAD EYE DIA REF	DIM. A ± 12	DIM. B ± .12	RAD C ± .12	DIA D ± .06
-1	1 3/4 TO 2	12.06	3.03	2.56	1.88
-2	2 1/4 TO 4	22.06	4.03	3.56	2.38

2	-	6	GRADE DH	NUT, HEAVY, HEX, 2.250-8UN-2B	ASTM A563	STEEL
-	2	5	GRADE DH	NUT, HEAVY, HEX, 1.750-8UN-2B	ASTM A563	STEEL
2	-	4	GRADE BD	BOLT, HEX HD, 2.250-8UN-2A X 9.25L	ASTM A354	STEEL
-	2	3	GRADE BD	BOLT, HEX HD, 1.750-8UN-2A X 6.25L	ASTM A354	STEEL
2	-	2		PLATE, 1.25 STK	ASTM A36	STEEL
-	2	1		PLATE, 1.00 STK	ASTM A36	STEEL
QTY REQD	QTY REQD	FIND NO.	PART OR IDENTIFYING NO.	PART OR IDENTIFYING NO.	SPEC	MATERIAL
-2	-1		PARTS LIST			

NOTES:

1. PLATE SINKER SHACKLE MARKINGS SHALL BE AS SPECIFIED IN SECTION 3.7.

FIGURE 7
Plate Sinker Shackle



SECTION A-A
LOCATION FOR MARKINGS

(All Dimensions In Inches)

Nominal Diameter	A (min)	A (max)	B (min)	B (max)	C (min)	C (max)	D (min)	D (max)
1-3/4	2.25	2.38	11.50	11.67	4.19	4.32	1.38	1.44
2	2.50	2.63	13.73	14.03	4.91	5.21	1.64	1.74
2-1/4	2.75	2.87	14.50	14.69	5.37	5.50	1.73	1.83
2-1/2	3.00	3.13	16.16	16.34	5.92	6.05	1.92	2.02
2-3/4	3.50	3.63	17.17	17.88	6.47	6.60	2.11	2.21
3	3.75	3.83	19.21	19.33	6.82	7.28	2.28	2.40
3-1/2	4.25	4.33	23.90	24.08	8.77	8.90	2.85	2.79
4	4.75	4.87	26.22	25.40	9.61	9.74	3.13	3.25

NOTES:

1. MARKINGS SHALL BE AS SPECIFIED IN SECTION 3.7.

FIGURE 8
Pear Link

(All Dimensions in Inches)

Nominal Diameter	A (min)	A (max)	B (min)	B (max)	C (min)	C (max)
1-3/4	11.81	12.08	6.91	7.09	2.10	2.16
2	13.50	13.80	7.90	8.10	2.40	2.49
2-1/4	15.19	15.53	8.89	9.13	2.70	2.79
2-1/2	16.88	17.25	9.88	10.13	3.00	3.10
2-3/4	18.56	18.98	10.86	11.14	3.30	3.40
3	20.25	20.70	11.85	12.15	3.60	3.69
3-1/2	23.65	24.15	13.83	14.18	4.20	4.29
4	27.00	27.60	15.80	16.20	4.80	4.89

NOTE:

Markings shall be as specified in Section 3.8.

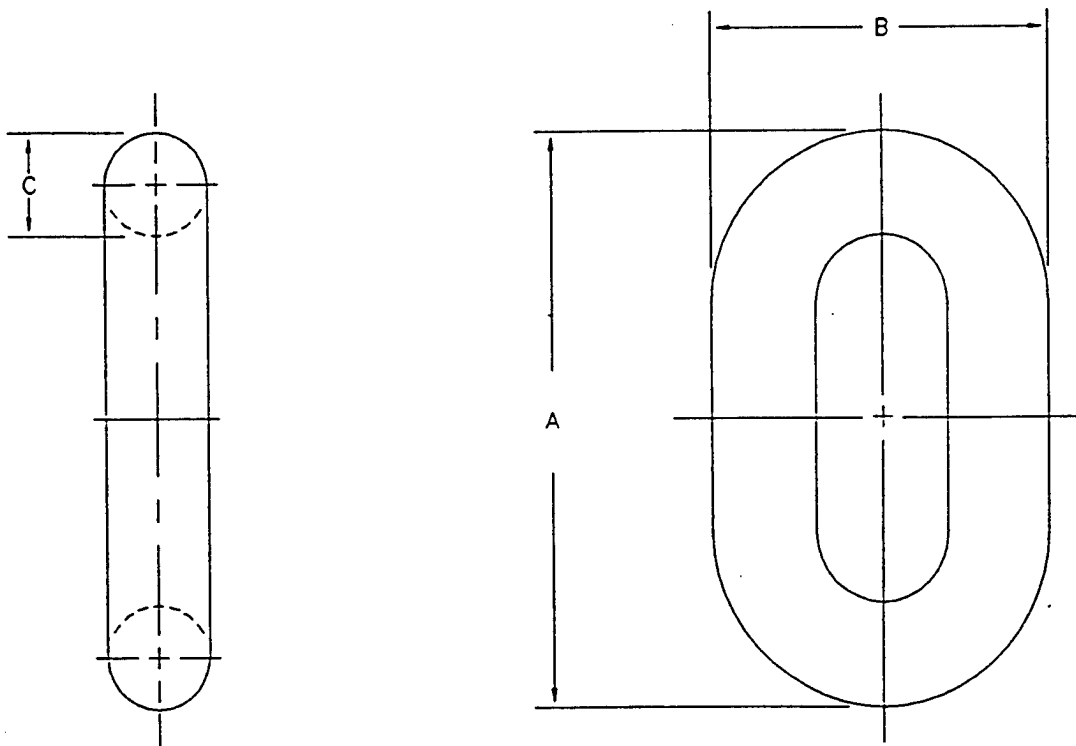


FIGURE 9
End Link

(All Dimensions in Inches)

Nominal Diameter	G (min)	G (max)	H (min)	H (max)	I (min)	I (max)	J (min)	J (max)	K
1-3/4	2.22	2.33	5.80	6.10	6.83	7.18	2.73	2.87	4.90
2	2.54	2.67	6.63	6.97	7.80	8.20	3.12	3.28	5.60
2-1/4	2.85	3.00	7.49	7.84	8.78	9.23	3.51	3.69	6.30
2-1/2	3.17	3.33	8.29	8.71	9.75	10.25	3.90	4.10	7.00
2-3/4	3.49	3.66	9.12	9.58	10.73	11.28	4.29	4.51	7.70
3	3.80	4.00	9.95	10.46	11.70	12.30	4.68	4.92	8.40
3-1/2	4.44	4.66	11.60	12.20	13.65	14.35	5.46	5.74	9.80
4	5.07	5.33	13.26	13.94	15.60	16.40	6.24	6.56	11.20

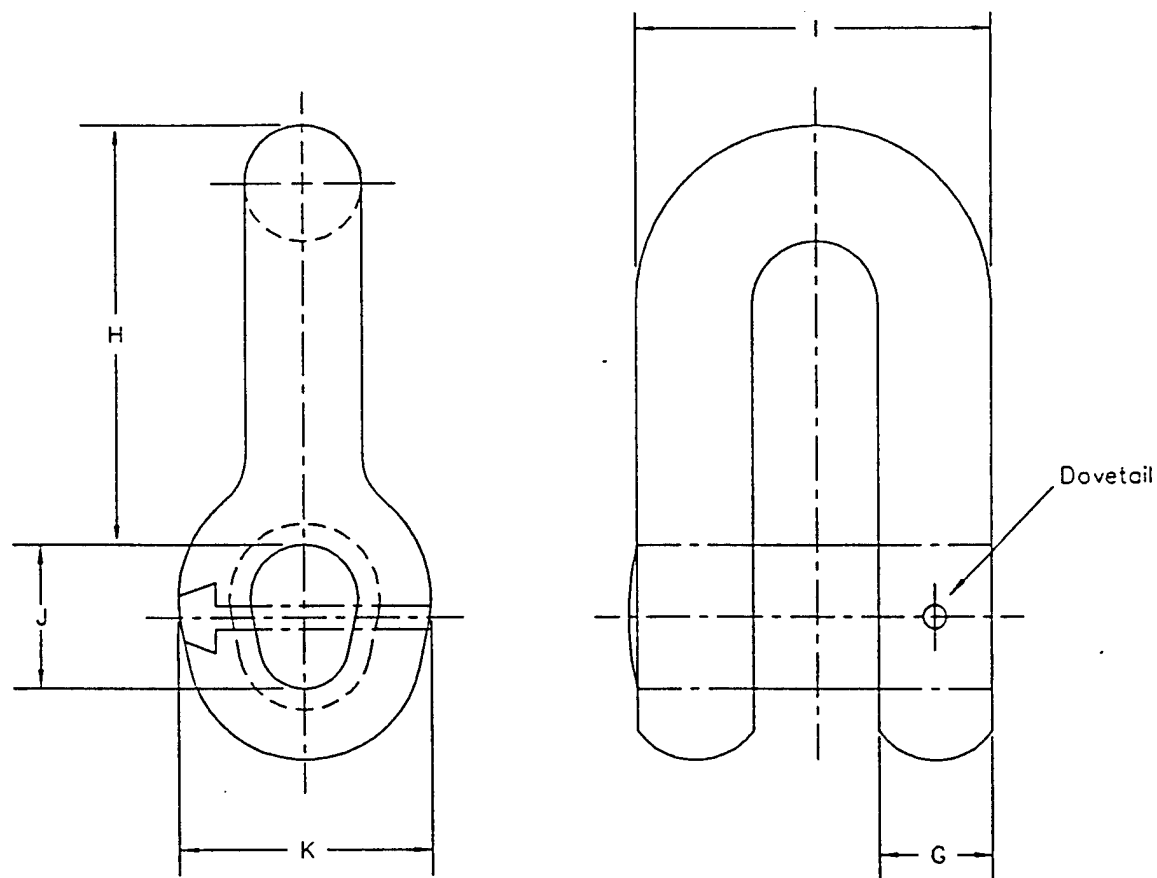


FIGURE 10
Joining Shackle

(All Dimensions in Inches)

Nominal Diameter	G (min)	G (max)	H (min)	H (max)	I (min)	I (max)	J (min)	J (max)	K
1-3/4	2.39	2.51	7.85	8.25	8.87	9.33	3.07	3.23	5.43
2	2.73	2.87	8.97	9.43	10.14	10.66	3.51	3.69	6.20
2-1/4	3.07	3.23	10.09	10.61	11.41	11.99	3.95	4.15	6.98
2-1/2	3.14	3.59	11.21	11.79	12.68	13.33	4.39	4.61	7.75
2-3/4	3.75	3.95	12.33	12.97	13.94	14.66	4.38	5.07	8.53
3	4.10	4.31	13.46	14.15	15.21	15.99	5.40	5.54	9.30
3-1/2	4.78	5.02	15.70	16.50	17.75	18.66	6.14	6.46	10.85
4	5.46	5.74	17.94	18.86	20.28	21.32	7.02	7.38	12.40

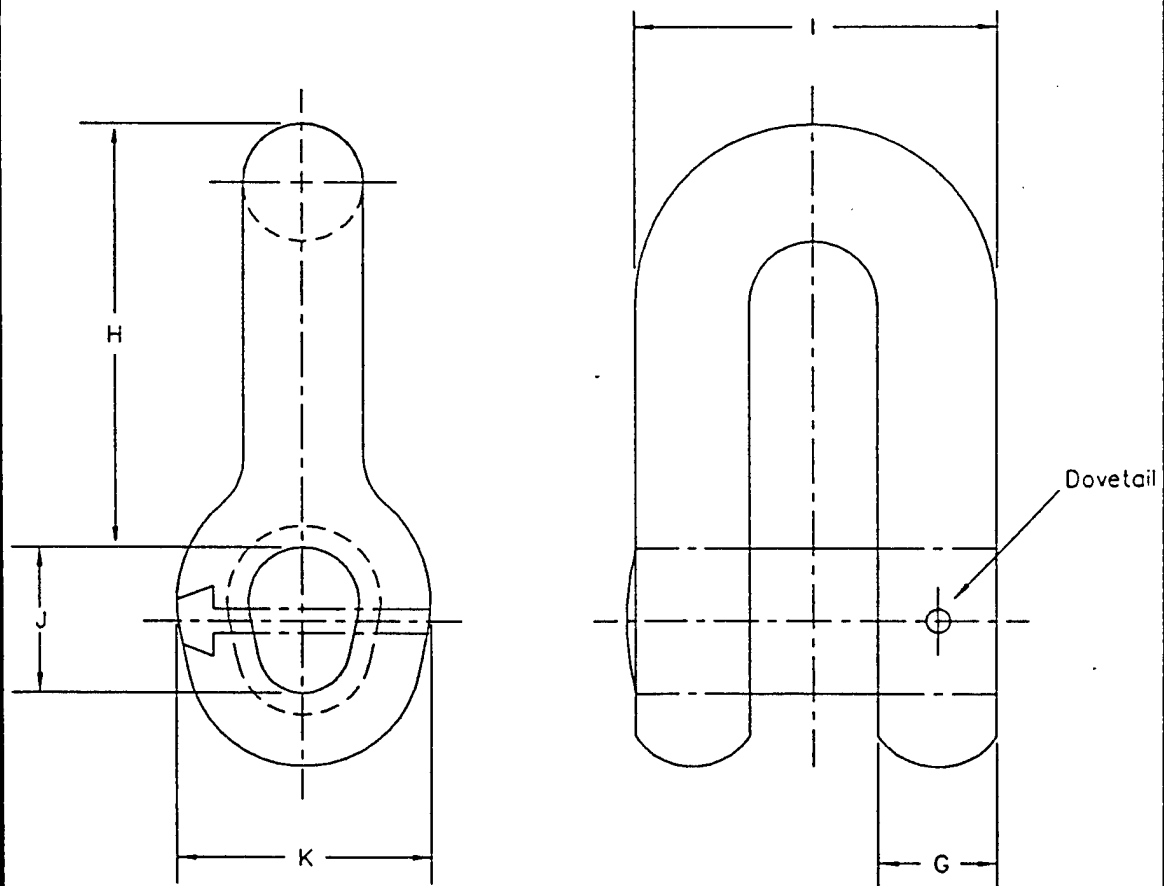
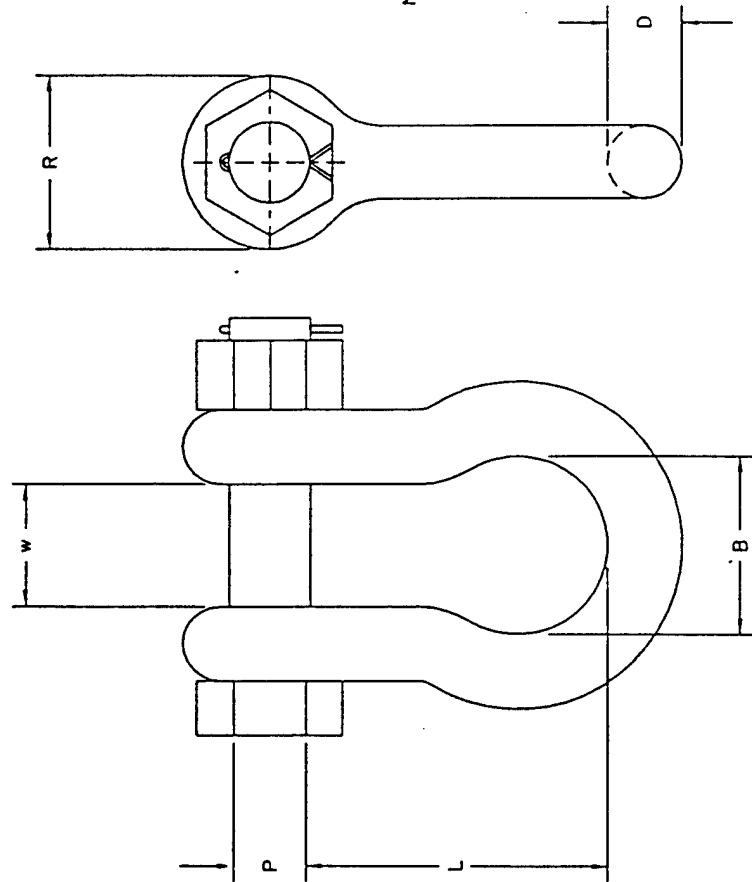


FIGURE 11
Anchor Shackle

(All Dimensions In Inches)

Nominal Diameter	W (min)	W (max)	P (min)	P (max)	R (min)	R (max)	L (min)	L (max)	D (min)	D (max)	B (min)	B (max)	Breaking Load (min pounds)
1-3/8	2.13	2.37	1.46	1.54	3.22	3.40	5.00	5.50	1.32	1.44	3.51	3.75	162,600
1-1/2	2.13	2.50	1.67	1.87	3.54	3.72	5.50	6.00	1.44	1.56	3.76	4.00	204,100
1-3/4	2.76	3.00	1.95	2.05	4.21	4.43	6.75	7.25	1.69	1.81	4.88	5.13	300,000
2	3.13	3.37	2.19	2.31	4.88	5.13	7.50	8.00	1.94	2.06	5.61	5.89	420,000
2-1/2	3.88	4.38	2.68	2.82	5.85	6.15	9.75	11.25	2.55	2.69	7.06	7.44	660,000
3	4.75	5.25	3.17	3.33	6.34	6.66	12.25	13.75	2.93	3.08	7.68	8.08	1,020,000
3-1/2	5.00	5.50	3.66	3.84	7.75	8.25	13.88	15.38	3.41	3.59	8.78	9.23	1,440,500
4	5.25	5.75	4.14	4.36	8.75	9.25	13.75	15.25	3.90	4.10	9.75	10.25	1,800,000



Note: Nominal Sizes Are The Manufacturer's Nomenclature And Do Not Correspond To The Nominal Chain Size. Specific Shackles Will Not Necessarily Have The Same Material And Strength Characteristics As Chain Of The Same Nominal Size. Buoy Shackles Shall Include Bolt, Nut, And Cotter Pin.

FIGURE 12
Buoy Shackle

TABLE 1
Mechanical Properties

Property	Chain and Accessories	Swivel Shackle Pins	Pear Links
Ultimate strength (tensile) minimum maximum	93,000 psi 115,000 psi	145,000 psi 170,000 psi	150,000 psi
Elongation minimum (gage length = 5X specimen diameter)	17 percent	12 percent	9 percent
Reduction in area minimum	40 percent	40 percent	22 percent
Brinell Hardness (standard ball: 10mm ball and 3000 Kg load) chain accessories	192-229 192-235	321 - 365	300 - 370
Impact; average of three specimens at 32F (minimum) base metal across weld cast components	43 ft lb 36 ft lb 30 ft lb	43 ft lb	30 ft lb 26 ft lb 15 ft lb

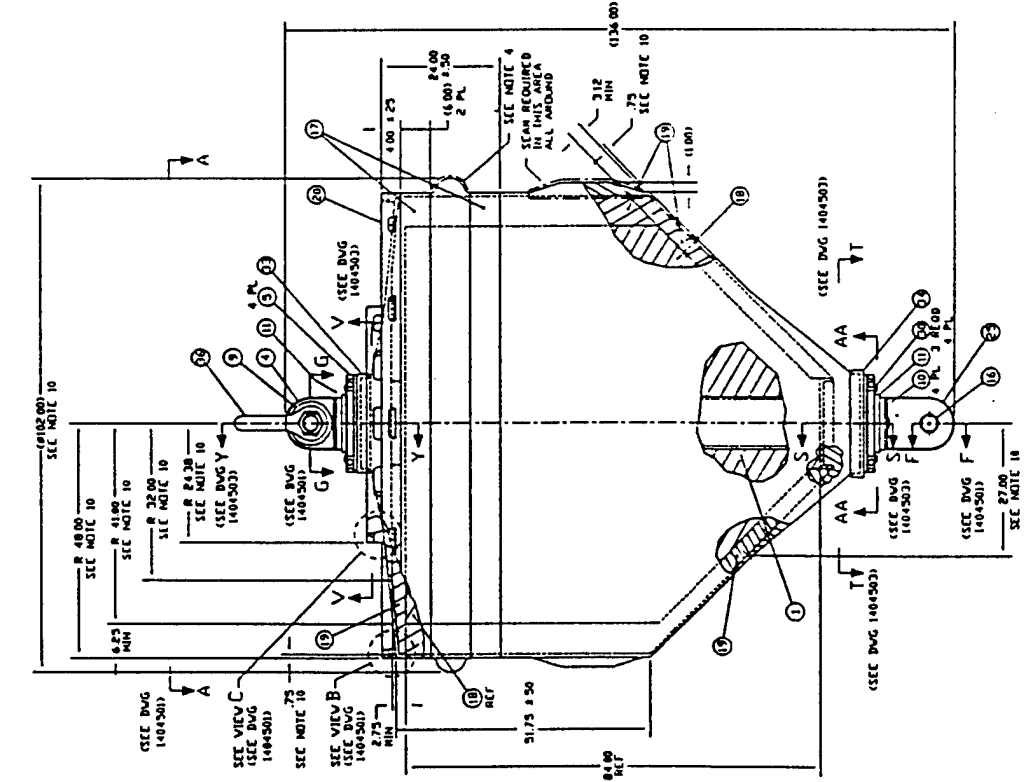
TABLE 2
Physical Properties of Finished Chain and Accessories

Chain Diameter (inches)	Proof Load (lbs)	Minimum Breaking Load (lbs)	Minimum Chain Weight per Shot (lbs)
1-3/4	247,000	352,000	2252
2	318,000	454,000	3276
2-1/4	396,000	570,000	4143
2-1/2	484,000	692,000	5138
2-3/4	578,000	826,000	6250
3	679,000	970,000	7459
3-1/2	900,000	1,285,000	10258
4	1,143,000	1,632,000	13358

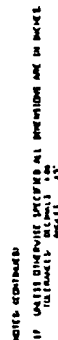
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PROJECT NO.	1404500
PROJECT TITLE	NAVY FACILITIES ENGINEERING COMMAND
PROJECT LOCATION	NAVY FACILITIES ENGINEERING COMMAND
PROJECT STATUS	NAVY FACILITIES ENGINEERING COMMAND
PROJECT DATE	NAVY FACILITIES ENGINEERING COMMAND
PROJECT DRAWN BY	NAVY FACILITIES ENGINEERING COMMAND
PROJECT CHECKED BY	NAVY FACILITIES ENGINEERING COMMAND
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PROJECT APPROVED BY	NAVY FACILITIES ENGINEERING COMMAND
PROJECT REVISIONS	NAVY FACILITIES ENGINEERING COMMAND



Foam Filled Mooring Buoy
Polyurethane, 8 Ft. Diameter, Class AA

[illegible]

0153 COMPANY ID

- [illegible]

[illegible]

TABLE E-1
Predicted Single Anchor Drag Distances

Anchor: Stockless Anchor with Stabilizers and Flukes Fixed at
approximately 45°

Seafloor Type: Mud

		Horizontal Design Load (kips)											
		25.	50.	75.	100.	125.	150.	175.	200.	225.	250.	275.	300.
Anchor Weight (Kips)													
6.	54.	*	*	*	*	*	*	*	*	*	*	*	*
7.	32.	*	*	*	*	*	*	*	*	*	*	*	*
8.	21.	*	*	*	*	*	*	*	*	*	*	*	*
9.	13.	*	*	*	*	*	*	*	*	*	*	*	*
10.	9.	*	*	*	*	*	*	*	*	*	*	*	*
11.	6.	183.	*	*	*	*	*	*	*	*	*	*	*
12.	6.	99.	*	*	*	*	*	*	*	*	*	*	*
13.	6.	64.	*	*	*	*	*	*	*	*	*	*	*
14.	5.	47.	*	*	*	*	*	*	*	*	*	*	*
15.	5.	40.	*	*	*	*	*	*	*	*	*	*	*
16.	5.	33.	*	*	*	*	*	*	*	*	*	*	*
17.	4.	27.	*	*	*	*	*	*	*	*	*	*	*
18.	4.	22.	154.	*	*	*	*	*	*	*	*	*	*
19.	4.	17.	95.	*	*	*	*	*	*	*	*	*	*
20.	3.	14.	77.	*	*	*	*	*	*	*	*	*	*
21.	3.	12.	64.	*	*	*	*	*	*	*	*	*	*
22.	2.	10.	53.	*	*	*	*	*	*	*	*	*	*
23.	2.	8.	48.	*	*	*	*	*	*	*	*	*	*
24.	2.	8.	42.	202.	*	*	*	*	*	*	*	*	*
25.	1.	8.	37.	152.	*	*	*	*	*	*	*	*	*
26.	1.	8.	33.	104.	*	*	*	*	*	*	*	*	*
27.	1.	7.	29.	89.	*	*	*	*	*	*	*	*	*
28.	1.	7.	25.	78.	*	*	*	*	*	*	*	*	*
29.	1.	7.	21.	68.	*	*	*	*	*	*	*	*	*
30.	0.	7.	19.	59.	245.	*	*	*	*	*	*	*	*

Drag Distance (Feet)

*Exceeds anchor ultimate holding capacity

TABLE E-1 (Continued)
Predicted Single Anchor Drag Distances

Anchor: Stockless Anchor with Stabilizers and Flukes Fixed at
approximately 36°

Seafloor Type: Sand

		Horizontal Design Load (kips)											
		25.	50.	75.	100.	125.	150.	175.	200.	225.	250.	275.	300.
Anchor Weight (Kips)													
5.	20.	*	*	*	*	*	*	*	*	*	*	*	*
6.	19.	*	*	*	*	*	*	*	*	*	*	*	*
7.	18.	37.	*	*	*	*	*	*	*	*	*	*	*
8.	17.	33.	*	*	*	*	*	*	*	*	*	*	*
9.	17.	29.	*	*	*	*	*	*	*	*	*	*	*
10.	17.	28.	*	*	*	*	*	*	*	*	*	*	*
11.	17.	27.	46.	*	*	*	*	*	*	*	*	*	*
12.	17.	26.	43.	*	*	*	*	*	*	*	*	*	*
13.	17.	26.	39.	*	*	*	*	*	*	*	*	*	*
14.	17.	25.	37.	*	*	*	*	*	*	*	*	*	*
15.	17.	24.	35.	*	*	*	*	*	*	*	*	*	*
16.	17.	24.	34.	52.	*	*	*	*	*	*	*	*	*
17.	17.	23.	33.	49.	*	*	*	*	*	*	*	*	*
18.	17.	23.	32.	46.	*	*	*	*	*	*	*	*	*
19.	18.	23.	32.	44.	*	*	*	*	*	*	*	*	*
20.	18.	23.	31.	41.	*	*	*	*	*	*	*	*	*
21.	18.	22.	31.	40.	57.	*	*	*	*	*	*	*	*
22.	18.	22.	30.	39.	54.	*	*	*	*	*	*	*	*
23.	18.	22.	30.	38.	52.	*	*	*	*	*	*	*	*
24.	18.	22.	29.	37.	50.	*	*	*	*	*	*	*	*
25.	18.	22.	29.	36.	48.	*	*	*	*	*	*	*	*
26.	17.	22.	28.	36.	46.	62.	*	*	*	*	*	*	*
27.	17.	23.	28.	36.	45.	60.	*	*	*	*	*	*	*
28.	17.	23.	28.	35.	43.	58.	*	*	*	*	*	*	*
29.	17.	23.	28.	35.	43.	56.	*	*	*	*	*	*	*
30.	17.	23.	27.	35.	42.	54.	*	*	*	*	*	*	*

Drag Distance (Feet)

*Exceeds anchor ultimate holding capacity

TABLE E-1 (Continued)
Predicted Single Anchor Drag Distances

Anchor: Stato Anchor with Stabilizers and Flukes Fixed at
 apporoximately 50°

Seafloor Type: Mud

	Horizontal Design Load (kips)											
	25.	50.	75.	100.	125.	150.	175.	200.	225.	250.	275.	300.
Anchor Weight (Kips)												
5.	4.	23.	64.	158.	*	*	*	*	*	*	*	*
6.	3.	15.	45.	96.	236.	*	*	*	*	*	*	*
7.	2.	10.	34.	68.	127.	322.	*	*	*	*	*	*
8.	2.	7.	25.	52.	93.	168.	398.	*	*	*	*	*
9.	1.	6.	18.	43.	72.	120.	205.	*	*	*	*	*
10.	1.	6.	14.	35.	57.	94.	148.	280.	*	*	*	*
11.	1.	5.	11.	27.	50.	76.	118.	183.	352.	*	*	*
12.	0.	4.	9.	21.	43.	63.	96.	140.	216.	418.	*	*
13.	0.	4.	8.	18.	36.	56.	81.	118.	169.	266.	*	*
14.	0.	3.	7.	15.	29.	50.	68.	99.	138.	200.	333.	*
15.	0.	3.	7.	13.	24.	43.	61.	85.	118.	158.	229.	395.
16.	0.	3.	6.	10.	21.	37.	55.	73.	102.	138.	188.	265.
17.	0.	2.	6.	10.	18.	32.	50.	66.	90.	120.	156.	216.
18.	0.	2.	5.	9.	16.	27.	44.	61.	78.	106.	138.	179.
19.	0.	2.	5.	8.	14.	24.	39.	56.	71.	94.	122.	156.
20.	0.	1.	5.	8.	12.	21.	34.	51.	66.	83.	109.	139.
21.	0.	1.	4.	7.	11.	19.	30.	46.	61.	75.	98.	124.
22.	0.	1.	4.	7.	10.	17.	26.	41.	56.	70.	88.	112.
23.	0.	1.	4.	7.	10.	15.	24.	36.	52.	66.	79.	102.
24.	0.	1.	3.	6.	9.	13.	22.	32.	47.	61.	74.	92.
25.	0.	1.	3.	6.	9.	12.	20.	28.	43.	57.	70.	83.
26.	0.	0.	3.	5.	8.	11.	18.	26.	39.	53.	66.	78.
27.	0.	0.	2.	8.	8.	11.	16.	24.	35.	49.	62.	74.
28.	0.	0.	2.	8.	8.	10.	15.	22.	31.	44.	58.	70.
29.	0.	0.	2.	7.	7.	10.	13.	21.	28.	41.	54.	66.
30.	0.	0.	2.	7.	7.	10.	12.	19.	26.	37.	50.	63.

Drag Distance (Feet)

*Exceeds anchor ultimate holding capacity

TABLE E-1 (Continued)
Predicted Single Anchor Drag Distances

Anchor: Stato Anchor with Stabilizers and Flukes Fixed at
approximately 30°

Seafloor Type: Sand

	Horizontal Design Load (Kips)											
	25.	50.	75.	100.	125.	150.	175.	200.	225.	250.	275.	300.
Anchor Weight (Kips)												
5.	15.	21.	28.	39.	55.	*	*	*	*	*	*	*
6.	15.	20.	27.	36.	45.	63.	*	*	*	*	*	*
7.	15.	20.	27.	32.	42.	51.	77.	*	*	*	*	*
8.	15.	20.	26.	30.	39.	47.	59.	91.	*	*	*	*
9.	15.	20.	25.	30.	36.	45.	53.	67.	103.	*	*	*
10.	15.	21.	24.	30.	33.	42.	50.	58.	74.	116.	*	*
11.	16.	20.	24.	29.	33.	40.	47.	55.	65.	88.	*	*
12.	16.	20.	24.	28.	33.	37.	45.	52.	59.	72.	101.	*
13.	16.	20.	24.	28.	33.	36.	43.	50.	57.	65.	79.	114.
14.	17.	20.	24.	27.	32.	36.	41.	48.	55.	61.	72.	91.
15.	17.	20.	24.	27.	32.	36.	39.	46.	53.	59.	65.	78.
16.	17.	20.	24.	27.	31.	36.	38.	44.	51.	57.	63.	72.
17.	17.	20.	24.	27.	31.	35.	38.	52.	49.	55.	61.	67.
18.	18.	20.	24.	27.	30.	35.	38.	41.	47.	54.	59.	65.
19.	18.	20.	24.	27.	30.	34.	38.	41.	46.	52.	58.	63.
20.	18.	20.	24.	27.	30.	34.	38.	40.	44.	50.	56.	62.
21.	18.	20.	24.	27.	30.	33.	37.	40.	43.	49.	55.	60.
22.	19.	21.	24.	27.	30.	33.	37.	40.	43.	47.	53.	59.
23.	19.	23.	24.	27.	30.	32.	36.	40.	43.	46.	52.	57.
24.	19.	21.	24.	27.	30.	32.	36.	40.	42.	45.	50.	56.
25.	19.	21.	24.	27.	30.	32.	36.	40.	42.	45.	49.	54.
26.	19.	21.	24.	27.	30.	32.	35.	39.	42.	44.	47.	53.
27.	20.	21.	24.	27.	30.	32.	35.	39.	42.	44.	46.	52.
28.	20.	21.	24.	27.	30.	32.	35.	38.	42.	44.	46.	50.
29.	20.	22.	24.	27.	30.	32.	34.	38.	41.	44.	46.	49.
30.	20.	22.	24.	27.	30.	32.	34.	37.	41.	44.	46.	48.

Drag Distance (Feet)

*Exceeds anchor ultimate holding capacity

TABLE E-2
Predicted Tandem Anchor Drag Distances

Anchor: Tandem Stockless Anchors with Stabilizers and Flukes Fixed at approximately 45°

Seafloor Type: Mud

		Horizontal Design Load (Kips)											
		25.	50.	75.	100.	125.	150.	175.	200.	225.	250.	275.	300.
Anchor Weight (Kips)													
5.	6.	*	*	*	*	*	*	*	*	*	*	*	*
6.	4.	54.	*	*	*	*	*	*	*	*	*	*	*
7.	4.	32.	*	*	*	*	*	*	*	*	*	*	*
8.	3.	21.	*	*	*	*	*	*	*	*	*	*	*
9.	3.	13.	70.	*	*	*	*	*	*	*	*	*	*
10.	2.	9.	47.	*	*	*	*	*	*	*	*	*	*
11.	2.	6.	35.	183.	*	*	*	*	*	*	*	*	*
12.	1.	6.	27.	99.	*	*	*	*	*	*	*	*	*
13.	1.	6.	21.	64.	*	*	*	*	*	*	*	*	*
14.	0.	5.	15.	47.	200.	*	*	*	*	*	*	*	*
15.	0.	5.	12.	40.	128.	*	*	*	*	*	*	*	*
16.	0.	5.	10.	33.	79.	*	*	*	*	*	*	*	*
17.	0.	4.	7.	27.	63.	*	*	*	*	*	*	*	*
18.	0.	4.	7.	22.	50.	154.	*	*	*	*	*	*	*
19.	0.	4.	7.	17.	44.	95.	*	*	*	*	*	*	*
20.	0.	3.	7.	14.	38.	77.	*	*	*	*	*	*	*
21.	0.	3.	6.	12.	33.	64.	179.	*	*	*	*	*	*
22.	0.	2.	6.	10.	28.	53.	124.	*	*	*	*	*	*
23.	0.	2.	6.	8.	23.	48.	90.	*	*	*	*	*	*
24.	0.	2.	6.	8.	19.	42.	77.	202.	*	*	*	*	*
25.	0.	1.	5.	8.	17.	37.	65.	152.	*	*	*	*	*
26.	0.	1.	5.	8.	15.	33.	56.	104.	*	*	*	*	*
27.	0.	1.	5.	7.	13.	29.	51.	89.	224.	*	*	*	*
28.	0.	1.	5.	7.	11.	25.	46.	78.	177.	*	*	*	*
29.	0.	0.	4.	7.	10.	21.	42.	68.	132.	*	*	*	*
30.	0.	0.	4.	7.	9.	19.	38.	59.	101.	245.	*	*	*

Drag Distance (Feet)

*Exceeds anchor system ultimate holding capacity

TABLE E-2 (Continued)
Predicted Tandem Anchor Drag Distances

Anchor: Tandem Stockless Anchors with Stabilizers and Flukes Fixed at approximately 36°

Seafloor Type: Sand

Horizontal Design Load (Kips)

	25.	50.	75.	100.	125.	150.	175.	200.	225.	250.	275.	300.
Anchor Weight (Kips)												
5.	13.	20.	32.	*	*	*	*	*	*	*	*	*
6.	13.	19.	27.	*	*	*	*	*	*	*	*	*
7.	13.	18.	25.	37.	*	*	*	*	*	*	*	*
8.	13.	17.	24.	33.	*	*	*	*	*	*	*	*
9.	13.	17.	23.	29.	42.	*	*	*	*	*	*	*
10.	13.	17.	22.	28.	38.	*	*	*	*	*	*	*
11.	13.	17.	21.	27.	34.	46.	*	*	*	*	*	*
12.	13.	17.	21.	26.	32.	43.	*	*	*	*	*	*
13.	13.	17.	20.	26.	31.	39.	*	*	*	*	*	*
14.	13.	17.	20.	25.	30.	37.	47.	*	*	*	*	*
15.	13.	17.	20.	24.	29.	35.	44.	*	*	*	*	*
16.	13.	17.	20.	24.	29.	34.	41.	52.	*	*	*	*
17.	13.	17.	20.	23.	28.	33.	39.	49.	*	*	*	*
18.	13.	17.	20.	23.	28.	32.	37.	46.	*	*	*	*
19.	13.	18.	20.	23.	27.	32.	36.	44.	53.	*	*	*
20.	13.	18.	20.	23.	27.	31.	35.	41.	50.	*	*	*
21.	13.	18.	20.	22.	26.	31.	35.	40.	48.	57.	*	*
22.	13.	18.	20.	22.	26.	30.	34.	39.	46.	54.	*	*
23.	13.	18.	20.	22.	26.	30.	34.	38.	44.	52.	*	*
24.	14.	18.	20.	22.	25.	29.	33.	37.	42.	50.	58.	*
25.	14.	18.	20.	22.	25.	29.	33.	36.	41.	48.	56.	*
26.	14.	17.	20.	22.	25.	28.	32.	36.	40.	46.	54.	62.
27.	14.	17.	20.	23.	25.	28.	32.	36.	40.	45.	52.	60.
28.	14.	17.	21.	23.	25.	28.	32.	35.	39.	43.	50.	58.
29.	14.	17.	21.	23.	25.	28.	31.	35.	38.	43.	49.	56.
30.	14.	17.	21.	23.	25.	27.	31.	35.	38.	42.	47.	54.

Drag Distance (Feet)

*Exceeds anchor system ultimate holding capacity

TABLE E-2 (Continued)
Predicted Tandem Anchor Drag Distances

Anchor: Tandem Stato Anchors with Stabilizers and Flukes Fixed at
approximately 50°

Seafloor Type: Mud

Anchor Weight (Kips)	Horizontal Design Load (Kips)											
	25.	50.	75.	100.	125.	150.	175.	200.	225.	250.	275.	300.
5.	.	4.	10.	23.	41.	64.	99.	158.	324.	*	*	*
6.	0.	3.	6.	15.	29.	45.	66.	96.	140.	236.	*	*
7.	0.	2.	5.	10.	19.	34.	48.	68.	94.	127.	182.	322.
8.	0.	2.	5.	7.	14.	25.	39.	52.	70.	93.	122.	168.
9.	0.	1.	4.	6.	11.	18.	30.	43.	55.	72.	93.	120.
10.	0.	1.	3.	6.	8.	14.	22.	35.	46.	57.	74.	94.
11.	0.	1.	3.	5.	7.	11.	18.	27.	39.	50.	60.	76.
12.	0.	0.	2.	4.	7.	9.	15.	21.	32.	43.	53.	63.
13.	0.	0.	2.	4.	6.	8.	12.	18.	25.	36.	46.	56.
14.	0.	0.	1.	3.	5.	7.	10.	15.	21.	29.	40.	50.
15.	0.	0.	1.	3.	5.	7.	9.	13.	18.	24.	34.	43.
16.	0.	0.	1.	3.	4.	6.	8.	10.	16.	21.	28.	37.
17.	0.	0.	0.	2.	4.	6.	8.	10.	13.	18.	24.	32.
18.	0.	0.	0.	2.	4.	5.	7.	9.	11.	16.	21.	27.
19.	0.	0.	0.	2.	3.	5.	7.	8.	10.	14.	19.	24.
20.	0.	0.	0.	1.	3.	5.	6.	8.	10.	12.	17.	21.
21.	0.	0.	0.	1.	3.	4.	6.	7.	9.	11.	15.	19.
22.	0.	0.	0.	1.	2.	4.	5.	7.	9.	10.	13.	17.
23.	0.	0.	0.	1.	2.	4.	5.	7.	8.	10.	11.	15.
24.	0.	0.	0.	1.	2.	3.	5.	6.	8.	9.	11.	13.
25.	0.	0.	0.	0.	1.	3.	4.	6.	7.	9.	10.	12.
26.	0.	0.	0.	0.	1.	3.	4.	5.	7.	8.	10.	11.
27.	0.	0.	0.	0.	1.	2.	4.	5.	7.	8.	9.	11.
28.	0.	0.	0.	0.	1.	2.	4.	5.	6.	8.	9.	10.
29.	0.	0.	0.	0.	1.	2.	3.	5.	6.	7.	9.	10.
30.	0.	0.	0.	0.	1.	2.	3.	4.	6.	7.	8.	10.

Drag Distance (Feet)

*Exceeds anchor system ultimate holding capacity

TABLE E-2 (Continued)
Predicted Tandem Anchor Drag Distances

Anchor: Tandem Stato Anchor with Stabilizers and Flukes Fixed at approximately 30°

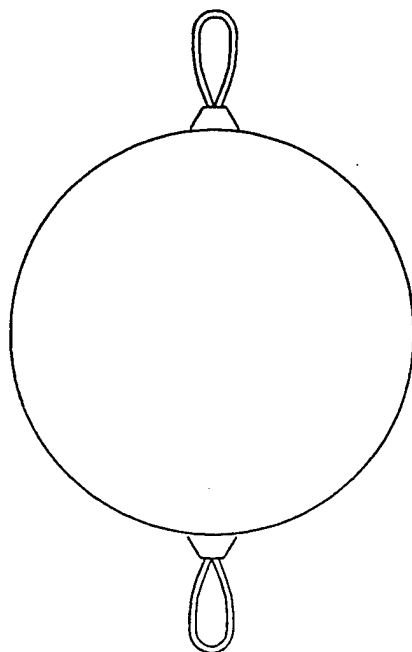
Seafloor Type: Sand

	Horizontal Design Load (Kips)											
	25.	50.	75.	100.	125.	150.	175.	200.	225.	250.	275.	300.
Anchor Weight (Kips)												
5.	12.	15.	18.	21.	25.	28.	34.	39.	45.	55.	78.	*
6.	13.	15.	18.	20.	24.	27.	30.	36.	41.	45.	52.	63.
7.	13.	15.	18.	20.	23.	27.	29.	32.	37.	42.	46.	51.
8.	13.	15.	18.	20.	22.	26.	28.	30.	34.	39.	43.	47.
9.	14.	15.	18.	20.	22.	25.	28.	30.	32.	36.	40.	45.
10.	14.	15.	18.	21.	22.	24.	27.	30.	32.	33.	38.	42.
11.	15.	16.	18.	20.	22.	24.	26.	29.	32.	33.	35.	40.
12.	15.	16.	18.	20.	22.	24.	26.	28.	31.	33.	35.	37.
13.	15.	16.	18.	20.	23.	24.	26.	28.	30.	33.	35.	36.
14.	16.	17.	18.	20.	23.	24.	26.	27.	30.	32.	34.	36.
15.	16.	17.	18.	20.	22.	24.	26.	27.	29.	32.	34.	36.
16.	16.	17.	18.	20.	22.	24.	26.	27.	29.	31.	34.	36.
17.	16.	17.	18.	20.	22.	24.	26.	27.	28.	31.	33.	35.
18.	17.	18.	19.	20.	22.	24.	26.	27.	28.	30.	32.	35.
19.	17.	18.	19.	20.	22.	24.	26.	27.	28.	30.	32.	34.
20.	17.	18.	19.	20.	22.	24.	26.	27.	29.	30.	32.	34.
21.	17.	18.	19.	20.	22.	24.	26.	27.	29.	30.	31.	33.
22.	18.	19.	19.	21.	22.	24.	26.	27.	29.	30.	31.	33.
23.	18.	19.	20.	21.	22.	24.	26.	27.	29.	30.	31.	32.
24.	18.	19.	20.	21.	22.	24.	26.	27.	29.	30.	31.	32.
25.	18.	19.	20.	21.	22.	24.	26.	27.	29.	30.	31.	32.
26.	19.	19.	20.	21.	22.	24.	26.	27.	29.	30.	31.	32.
27.	19.	20.	20.	21.	22.	24.	26.	27.	29.	30.	31.	32.
28.	19.	20.	21.	21.	22.	24.	26.	27.	29.	30.	31.	32.
29.	19.	20.	21.	22.	23.	24.	26.	27.	29.	30.	31.	32.
30.	19.	20.	21.	22.	23.	24.	26.	27.	29.	30.	31.	32.

Drag Distance (Feet)

*Exceeds anchor system ultimate holding capacity

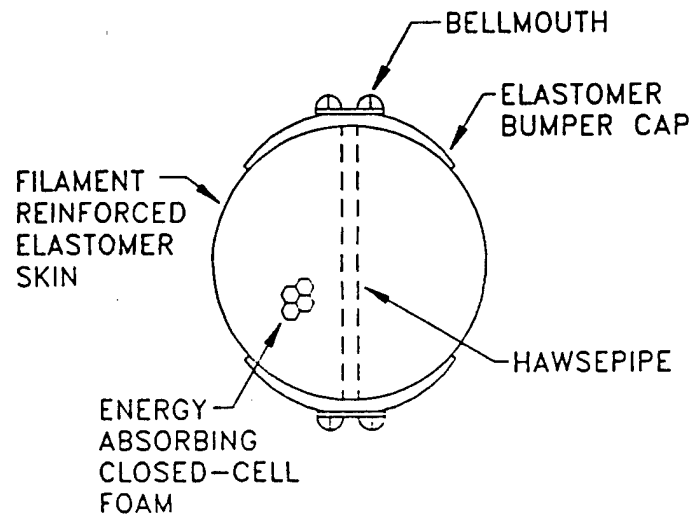
TABLE 70
Spherical Marker or Mooring Buoy¹



Weight.....	270 lbs
Dimensions.....	40 inches Diameter
Net Buoyancy.....	1240 lbs
Surface Visibility.....	23 sq ft.
Hull Construction.....	1/8" Fiberglass reinforced polyester resin
Foam Filling.....	4 lbs/ft ³ Closed cell polyurethane
Color.....	International orange

¹Data provided by Tideland Signal Corp.

TABLE 71
Spherical Marker or Mooring Buoy¹

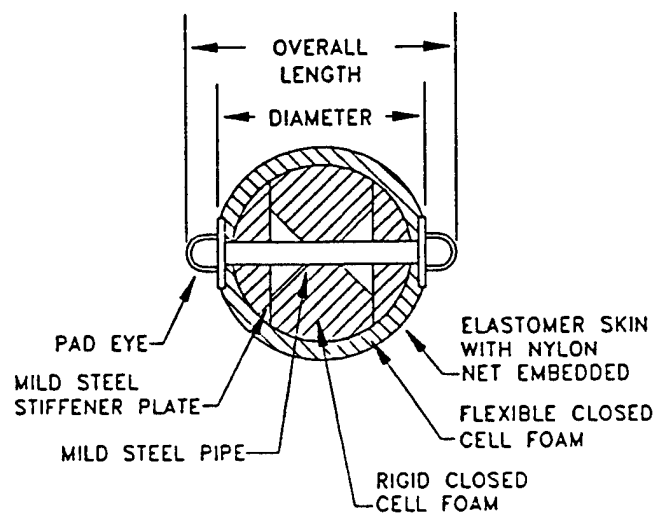


HAWSEPIPE TYPE

DIAMETER (FEET)	WEIGHT IN AIR (LBS.)	RESERVE BUOYANCY (LBS.)
6.0	1,500	5,500
7.0	2,200	9,000
8.0	2,900	14,000
9.0	3,900	20,000
10.0	5,900	28,000

¹Data provided by Seward International Co.

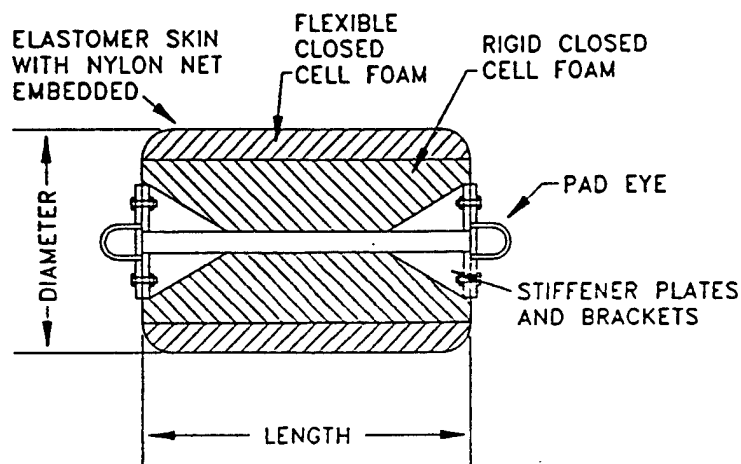
TABLE 72
Spherical Marker or Mooring Buoy¹



DIAMETER (FEET)	OVERALL LENGTH (FEET)	WEIGHT IN AIR (LBS.)	RESERVE BUOYANCY (LBS.)	MANUF PART NO.
2.50	4.50	75	500	SB5
3.25	5.25	150	1,000	SB10
3.75	5.75	205	1,500	SB15
4.20	6.20	290	2,000	SB20
4.40	6.40	350	2,500	SB25
4.75	6.75	395	3,000	SB30
5.20	7.20	470	4,000	SB40
5.60	7.60	605	5,000	SB50
5.90	7.90	750	6,000	SB60

¹Data provided by Samson Ocean Systems, Inc.

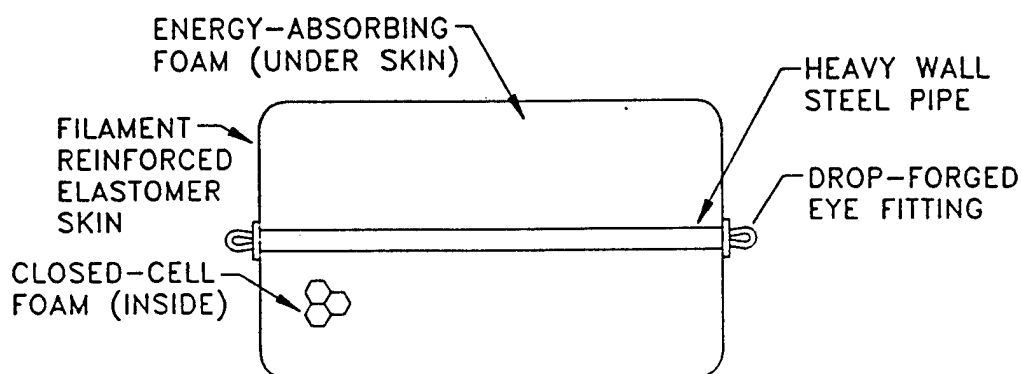
TABLE 73
Tension Bar Mooring Buoys¹



DIAMETER (FEET)	HEIGHT OR LENGTH (FEET)	WEIGHT IN AIR (LBS.)	RESERVE BUOYANCY (LBS.)	MANUF. PART NO.
2.00	4.0	200	500	CB5
2.50	4.0	250	1,000	CB10
3.00	4.0	310	1,500	CB15
3.50	4.0	460	2,000	CB20
4.00	4.5	600	3,000	CB30
4.00	6.0	825	4,000	CB40
4.50	6.0	1000	5,000	CB50
5.00	6.0	1150	6,000	CB60
5.50	6.5	1350	8,000	CB80
5.75	6.5	1625	10,000	CB100
6.00	8.0	2475	12,000	CB120

¹Data provided by Samson Ocean Systems, Inc.

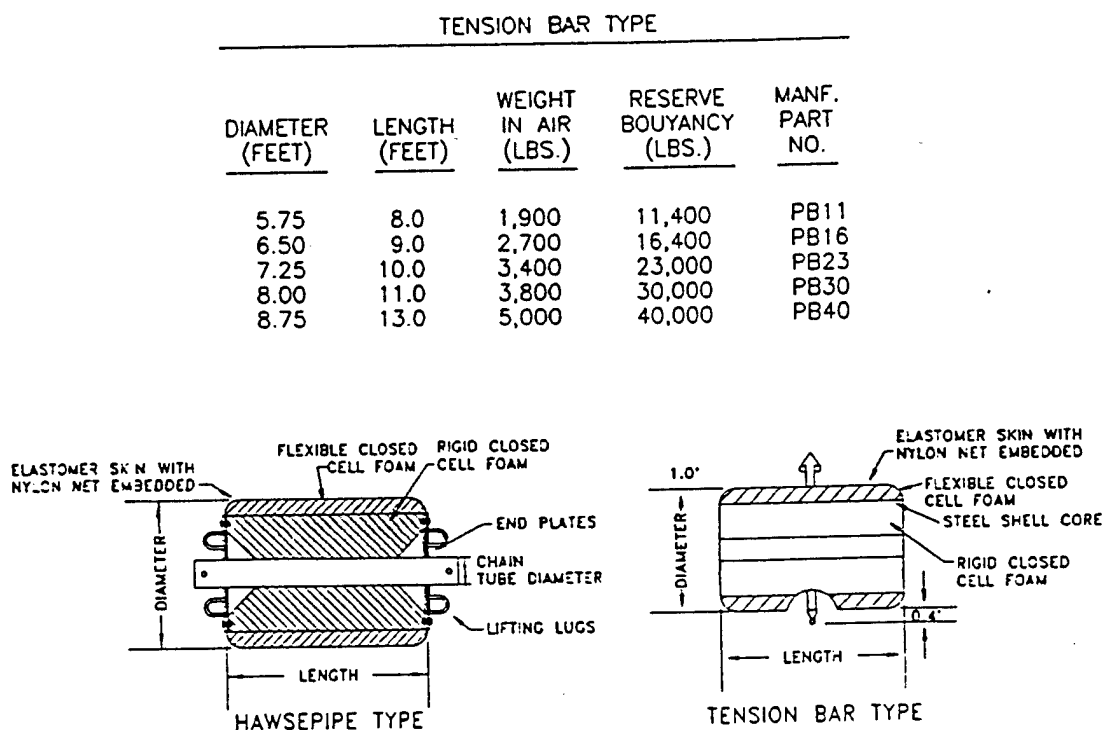
TABLE 74
Tension Bar Mooring Buoys¹



DIAMETER (INCHES)	HEIGHT OR LENGTH (INCHES)	OVERALL LENGTH (INCHES)	WEIGHT IN AIR (LBS.)	RESERVE BUOYANCY (LBS.)	PICK-UP LOAD RATING (LBS.)	PICK-UP EYE I.D. (INCHES)
20	30	40-3/8	40	300	5,000	2-1/4
24	36	47-7/8	70	500	7,500	2-1/2
29	43	61-7/8	140	1,000	10,000	3-1/8
37	59	79-3/8	230	2,000	20,000	4
50	81	102	700	5,000	40,000	4

¹Data provided by Seaward International Co.

TABLE 75
Hawsepipe and Tension Bar Buoys¹

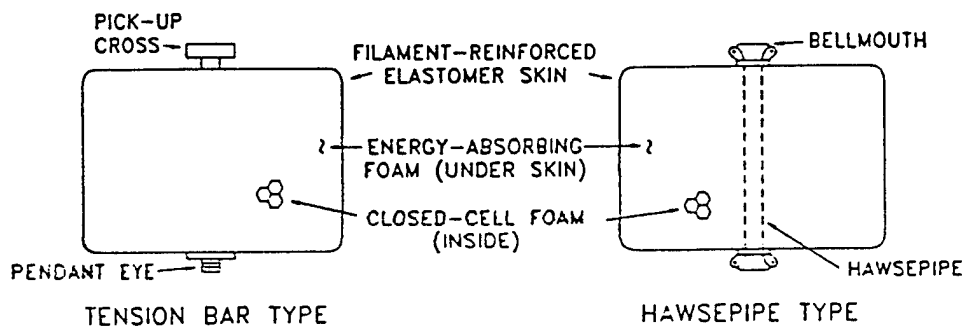


HAWSEPIPE TYPE

DIAMETER (FEET)	HEIGHT OR LENGTH (FEET)	WEIGHT IN AIR (LBS.)	RESERVE BOUYANCY (LBS.)	HAWSEPIPE INSIDE DIA (INCHES)	MANF. PART NO.
3.60	5.5	305	2,000	14	HB10
4.25	5.5	360	3,000	14	HB30
4.50	6.2	500	4,000	14	HB40
4.85	7.5	1,400	5,000	16	HB50
5.00	8.0	1,575	6,000	16	HB60
5.00	8.5	1,700	8,000	19	HB80
6.00	10.0	3,350	10,000	25	HB100
6.00	12.0	3,800	12,000	30	HB120

¹Data provided by Samson Ocean Systems, Inc.

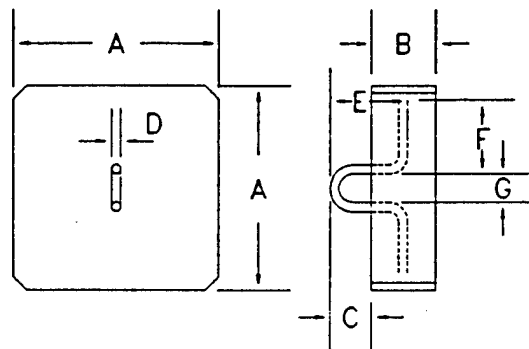
TABLE 76
Hawsepipe and Tension Bar Mooring Buoys¹



<u>DIAMETER</u> <u>(FEET)</u>	<u>HEIGHT</u> <u>OR</u> <u>LENGTH</u> <u>(FEET)</u>	<u>WEIGHT</u> <u>IN AIR</u> <u>(LBS.)</u>	<u>RESERVE</u> <u>BOUYANCY</u> <u>(LBS.)</u>	<u>PICK-UP LOAD</u> <u>RATING (LBS.)</u> <u>TENSION BAR TYPE</u>
5.4	8.0	1,500	10,000	10,000
6.2	9.2	2,000	15,000	15,000
6.8	10.1	2,500	20,000	20,000
7.7	11.5	3,300	30,000	30,000
8.4	12.6	4,000	40,000	40,000
9.1	13.5	5,000	50,000	50,000

¹Data provided by Secward International Co.

TABLE 77
Concrete Sinkers¹



WEIGHT (LBS.)	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	<u>F</u>	<u>G</u>
1,000	35	10	4	3/4	10	12	3-1/2
2,000	45	12	4	1	11	14	3-1/2
5,000	57	18	5	1-5/8	16	18	4

¹Data provided by Automatic Power, Inc.

TABLE 78
Holding Power to Weight Ratios of Various Anchors¹

ANCHOR ²	Holding Power and Type of Bottom		
	SAND	MUD/SILT	HARD/DENSE SOIL
U.S. Navy Stockless	4.5 ³	3 ³	--
U.S. Navy Lightweight	10	3	--
U.S. Navy State	20 ⁵	15 ⁵	15 ⁵
Danforth	10	3	--
Stock Anchor Type 1 (offdrill II)	13. ⁵	9	--
Moorfast	10	7	--
Boss	20	15	15 ⁵
Flipper Delta	15	15	15
Stevin	17	12 ⁶	15
Stevfix	20	--	20
Stevmud	--	19	--
Hook	--	18	10
Mark-2	20	--	--

¹The anchor holding power ratios given are intended for use with conventional anchor weights up to 33,000 lb. only; heavier conventional anchors may possess lower holding power to weight ratios. The holding power ratios represent values established by field tests performed by the Civil Engineering Laboratory, Naval Construction Battalion Center, Port Hueneme, California and are based on efficiencies achieved during maximum permissible drag of 50 feet. Higher holding power ratios may be achieved by some anchors during longer drags. The holding power ratios do not apply where anomalous sealer conditions exist; erratic or unsatisfactory anchor performance is experienced under conditions such as layered sealers (soft sediment over stiff/dense sediment or vice versa), gravely (placated) sealers, thin sediment layer above rock, and unconsolidated clays with cohesion to pressure ratios less than 0.15.

²For weight ranges and dimensional characteristics of anchors and appurtenances, see Tables in Sections 4 and 6.

³The flukes should be restricted to a 35° angle opening in sand and fixed fully open in mud.

⁴Values indicated are for fabricated (welded) anchors only. They should not be applied to cast anchors.

⁵Only with fluke angle reduced to 32° and with stabilizers lengthened by 35%.

⁶In very soft bottoms this anchor should be installed without the retrieving wire rope pendant attached to the corner eye opening in one of the flukes. This pendant may cause a dissymmetric strain leading to anchor instability and overturning resulting in a major loss of holding power.

TABLE 79
Moorings Without Sinkers Bills of Materials

Class		AAA (Proposed)		BBB (Proposed)	
Holding Power (lbs)		500,000		50,000	
Basic Depth (ft)		50		50	
Assembly No.		5381		5382	
Description of Item		Size		Size	
Tension bar Mooring Buoy		Req.	dia. hgt.	Req.	dia. hgt.
		1	15'0"x9'6"	1	15'0"x9'6"
Anchors		6	--1	6	--1
Chain Set Assembly No.		1	5788	1	5789
Class		AA		CC	
Holding Power (lbs)		300,000		200,000	
Basic Depth (ft)		50		50	
Assembly No.		5377		5379	
Description of Item		Size		Size	
Hawsepipe Mooring Buoy		Req.	dia. hgt.	Req.	dia. hgt.
		1	12'0"x6'0"	1	12'0"x6'0"
Anchors		6	--1	6	--1
Chain Set Assembly No.		1	5784	1	5785
Description of Item		Size		Size	
Hawsepipe Mooring Buoy		Req.	dia. hgt.	Req.	dia. hgt.
		1	12'0"x6'0"	1	12'0"x6'0"
Anchors		6	--1	6	--1
Chain Set Assembly No.		1	5784	1	5785
Description of Item		Size		Size	
Hawsepipe Mooring Buoy		Req.	dia. hgt.	Req.	dia. hgt.
		1	12'0"x6'0"	1	12'0"x6'0"
Anchors		6	--1	6	--1
Chain Set Assembly No.		1	5784	1	5785

For anchor selection procedure, see introduction to this part.

TABLE 80
Moorings Without Sinkers Chain Set Assembly for Basic Depth

Mooring Class	AAA (Proposed)			BBB (Proposed)		
Basic Depth (ft.)	50			50		
Chain Set Assembly No.	5788			5789		
Description of Item	Reqd.	Chain		Reqd.	Chain	
		Spare ¹	Size		Spare ¹	Size
Riser chain (45 ft.)	1	-	4-1/2	1	-	4-1/2
Ground chain (90 ft.) ²	42	-	3	36	-	3
Ground chain (45 ft.)	0	-	3	0	-	3
Ground ring	1	-	4-1/2	1	-	4-1/2
Spider	3	-	-	3	-	-
End link ass. #1	1	-	4-1/2	1	-	4-1/2
End link ass. #1	12	-	3	12	-	3
End link ass. #2	3	-	4-1/2	3	-	4-1/2
Anchor link (pear shaped)	4	-	4-1/2	4	-	4-1/2
Detachable Link	3	1	4-1/2	3	1	4-1/2
Joining Link	48	16	3	42	14	3
End shackle	3	1	4-1/2	3	1	4-1/2
End shackle	6	1	3	6	1	3
Swivel assembly	1	-	4-1/2	1	-	4-1/2
Swivel shackle	6	-	3	6	-	3

Mooring Class	AA			BB			CC			DD		
Basic Depth (ft.)	50			50			50			50		
Chain Set Assembly No.	5784			5785			5786			5787		
Description of Item	Reqd.	Chain		Reqd.	Chain		Reqd.	Chain		Reqd.	Chain	
		Spare ¹	Size		Spare ¹	Size		Spare ¹	Size		Spare ¹	Size
Riser chain (45 ft.) ¹	1	-	4	1	-	3-1/2	1	-	3-1/2	1	-	3
Ground chain (90 ft.) ²	24	-	2-3/4	24	-	2-1/2	24	-	2-1/4	12	-	3
Ground chain (45 ft.)	6	-	2-3/4	6	-	2-1/2	6	-	2-1/4	3	-	3
Ground ring	1	-	3-1/2	1	-	3-1/2	1	-	3-1/2	1	-	3
Spider	3	-	-	3	-	-	3	-	-	-	-	-
End link	1	-	4	1	-	3-1/2	1	-	3-1/2	1	-	3
f-shackle with legs	1	1	4	1	1	3-1/2	1	1	3-1/2	1	1	3
Anchor Joining Link	8	1	4	8	1	3-1/2	8	1	3-1/2	-	-	-
Anchor Joining Link	12	3	2-3/4	12	3	2-1/2	12	3	2-1/4	8	2	3
Chain Joining Link ³	1	2	4	1	1	3-1/2	1	1	3-1/2	-	-	-
Chain Joining Link ³	30	10	2-3/4	30	10	2-1/2	30	10	2-1/4	16	6	3
Chain swivel ³	1	-	4	1	-	3-1/2	1	-	3-1/2	-	-	-
Chain swivel ³	6	-	2-3/4	6	-	2-1/2	6	-	2-1/4	4	-	3
Putting casting	1	-	4	1	-	3-1/2	1	-	3-1/2	1	-	3

¹Ship to advanced bases for each Assembly regardless of water depth.

²Length of each ground leg includes one more shot of chain than that required by catenary configuration at rated load. This extra shot serves to accommodate any temporary load increases due to dynamic forces.

³If still in stock, a swivel chain shot of the same size may be substituted in the riser or ground chain for the listed swivel and chain shot. Each swivel chain shot will replace 1 chain shot, 1 swivel, and 1 chain joining link in the Bill of Materials

TABLE 81
Moorings Without Sinkers Lengths of Ground Chain Required for Various Water Depths¹

Depth of Water (ft)	(Proposed)		Class			
	AAA ²	BBB ²	AA	BB	CC	DD
Basic -	7	6	4-1/2	4-1/2	4-1/2	4-1/2
Basic to 50	7	6	4-1/2	4-1/2	4-1/2	4-1/2
50 to 60	7-1/2	6-1/2	5	5	5	5
60 to 70	8	7	5	5-1/2	5-1/2	5
70 to 80	8-1/2	7	5-1/2	5-1/2	5-1/2	5-1/2
80 to 90	9	7-1/2	6	6	6	6
90 to 100	9-1/2	8	6 ³	6-1/2	6-1/2	6
100 to 115	10	8	-	6-1/2	6-1/2	6-1/2
115 to 130	10	8-1/2	-	7 ³	7 ³	7
130 to 145	10-1/2 ³	9 ³	-	-	-	7
145 to 160	-	-	-	-	-	7-1/2
160 to 175	-	-	-	-	-	8
175 to 190	-	-	-	-	-	8 ³

¹Lengths are 90 ft. shots. Depth of water is taken at mean high water from a firm bottom at anchor location.

²Includes an extra shot of chain to accommodate any temporary load increases due to dynamic forces.

³Freeboard limit of 2 ft. reached at this water depth for buoy size indicated in Table 79.

TABLE 82
Moorings Without Sinkers Chain Set Assemblies for Various Water Depths¹

Depth of Water (feet)	Class											
	AAA (Proposed)						BBB (Proposed)					
	3'	3'	3'	4-1/2'	4-1/2'	4-1/2'	3'	3'	3'	4-1/2'	4-1/2'	4-1/2'
	chain (90° shot)	chain (45° shot)	Joining Link	chain (90° shot)	chain (45° shot)	Detachable Link	chain (90° shot)	chain (45° shot)	Joining Link	chain (90° shot)	chain (45° shot)	Detachable Link
Basic to 50	000	000	000	000	000	000	000	000	000	000	000	000
50 to 60	000	000	000	000	000	000	000	000	000	000	000	000
60 to 70	000	000	000	000	000	000	000	000	000	000	000	000
70 to 80	000	000	000	000	000	000	000	000	000	000	000	000
80 to 90	000	000	000	000	000	000	000	000	000	000	000	000
90 to 100	000	000	000	000	000	000	000	000	000	000	000	000
100 to 115	000	000	000	000	000	000	000	000	000	000	000	000
115 to 130	000	000	000	000	000	000	000	000	000	000	000	000
130 to 145	000	000	000	000	000	000	000	000	000	000	000	000
145 to 160	000	000	000	000	000	000	000	000	000	000	000	000
160 to 175	000	000	000	000	000	000	000	000	000	000	000	000
175 to 190	000	000	000	000	000	000	000	000	000	000	000	000

Depth of Water (feet)	Class											
	AAA (Proposed)						BBB (Proposed)					
	3'	3'	3'	4-1/2'	4-1/2'	4-1/2'	3'	3'	3'	4-1/2'	4-1/2'	4-1/2'
	chain (90° shot)	chain (45° shot)	Joining Link	chain (90° shot)	chain (45° shot)	Detachable Link	chain (90° shot)	chain (45° shot)	Joining Link	chain (90° shot)	chain (45° shot)	Detachable Link
Basic to 50	000	000	000	000	000	000	000	000	000	000	000	000
50 to 60	000	000	000	000	000	000	000	000	000	000	000	000
60 to 70	000	000	000	000	000	000	000	000	000	000	000	000
70 to 80	000	000	000	000	000	000	000	000	000	000	000	000
80 to 90	000	000	000	000	000	000	000	000	000	000	000	000
90 to 100	000	000	000	000	000	000	000	000	000	000	000	000
100 to 115	000	000	000	000	000	000	000	000	000	000	000	000
115 to 130	000	000	000	000	000	000	000	000	000	000	000	000
130 to 145	000	000	000	000	000	000	000	000	000	000	000	000
145 to 160	000	000	000	000	000	000	000	000	000	000	000	000
160 to 175	000	000	000	000	000	000	000	000	000	000	000	000
175 to 190	000	000	000	000	000	000	000	000	000	000	000	000

¹Add to Basic Chain Assembly to obtain Assembly for a particular depth.
A negative sign denotes removal of that amount from the Basic Assembly

TABLE 83
Moorings Without Sinkers Bills of Materials

Class	A	B	C	D	E	F	G
Holding Power (lbs)	150,000	125,000	100,000	75,000	50,000	25,000	5,000
Basic Depth (ft)	50	45	40	35	35	30	25
Assembly No.	5370	5371	5372	5373	5374	5375	5376
Description of Item	Regd Size	Regd Size	Regd Size	Regd Size	Regd Size	Regd Size	Regd Size
Riser buoy	1 dia 12'0"	1 dia 12'0"	1 dia 10'6"	1 dia 10'6"	1 dia 9'6"	1 dia 9'6"	1 dia 3'6"
	hgt 6'0"	hgt 6'0"	hgt 6'6"	hgt 6'6"	hgt 5'0"	hgt 5'0"	hgt 5'0"
Anchors	3 --1	3 --1	3 --1	3 --1	3 --1	3 --1	3 --1
Chain Set Assembly No.	1 5777	1 5778	1 5779	1 5780	1 5781	1 5782	1 5783

¹For anchor selection procedure, see introduction to this part.

TABLE 84
Mooring Without Sinkers Chain Set Assembly for Basic Depth

Chain Set Assembly No.	A		B		C		D		E		F		G		
	50	5777	40	5779	30	5780	35	5781	30	5782	25	5783			
Description of Item	Reqd	Spare ¹	Chain Size	Reqd	Spare ¹	Chain Size	Reqd	Spare ¹	Chain Size	Reqd	Spare ¹	Chain Size	Reqd	Spare ¹	Chain Size
Riser chain (45 ft.) ²	1	-	2-3/4	1	-	2-1/2	1	-	2-1/4	1	-	1-3/4	1	-	3/4
Ground chain (90 ft.) ²	12	-	2-3/4	12	-	2-1/2	12	-	2-1/4	12	-	1-3/4	9	-	3/4
Ground chain (45 ft.) ²	3	-	2-3/4	3	-	2-1/2	0	-	2-1/4	0	-	1-3/4	3	-	3/4
Ground ring	1	-	2-3/4	1	-	2-1/2	1	-	2-1/4	1	-	1-3/4	1	-	3/4
End Link	1	-	2-3/4	1	-	2-1/2	1	-	2-1/4	1	-	1-3/4	1	-	3/4
F-shackle without lugs	-	-	-	-	-	-	-	-	-	1	1	1-3/4	1	-	-
F-shackle with lugs	1	1	2-3/4	1	1	2-1/2	1	1	2-1/4	1	1	2	-	-	-
Anchor joining link	8	2	2-3/4	8	2	2-1/2	8	2	2-1/4	8	2	1-3/4	8	2	3/4
Joining link ²	16	6	2-3/4	16	6	2-1/2	13	6	2-1/4	13	6	1-3/4	10	6	3/4
Swivel ²	4	-	2-3/4	4	-	2-1/2	4	-	2-1/4	4	-	1-3/4	4	-	3/4
Joining link	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rubber casting	1	-	2-3/4	1	-	2-1/2	-	-	-	-	-	-	-	-	-

¹Ship to advanced bases for each assembly regardless of water depth.

²If still in stock, a swivel chain shot of the same size may be substituted in the riser or ground chain for the listed swivel and chain shot. Each swivel chain shot will replace 1 chain shot, 1 swivel, and 1 chain joining link in the Bill of Materials.

TABLE 85
Moorings Without Sinkers Maximum Mooring Depths With Various Buoys

Buoy Details	NAVFAC Dwg 620,662	NAVFAC Dwg 620,659 bar type		NAVFAC Dwg 620,605	NAVFAC Dwg 620,659
Size	3'6" spherical	Dia. Hgt. 9'6"x5'0"	Dia. Hgt. 10'6"x6'6"	Dia. Hgt. 12'0"x6'0"	Dia. Hgt. 10'6"x7'6"
Class	Depth (ft) ¹				
A	-	-	-	225	-
B	-	-	-	280	-
C	-	75	305	-	425
D	-	105	395	-	545
E	-	155	525	-	-
F	-	-	-	-	-
G	140 ²	-	-	-	-

¹Buoys have a 2-ft. freeboard at depths tabulated, except as noted.

²1-ft. freeboard.

TABLE 86

Moorings Without Sinkers Lengths of Ground Chain Required for Various Water Depths¹

Depth of Water (ft)	Class						
	A	B	C	D	E	F	G
Basic	4-1/2	4-1/2	4	4	3-1/2	3-1/2	3
Basic to 50	4-1/2	4-1/2	4-1/2	4-1/2	4-1/2	4-1/2	3-1/2
50 to 60	5	5	5	5	4-1/2	4-1/2	4
60 to 70	5	5-1/2	5-1/2	5-1/2	5	5	4
70 to 80	5-1/2	5-1/2	5-1/2	5-1/2	5-1/2	5-1/2	4-1/2
80 to 90	6	6	6	6	5-1/2	5-1/2	4-1/2
90 to 100	6-1/2	6-1/2	6-1/2	6-1/2	6	6	4-1/2
100 to 120	7	7	7	7	6	6-1/2	5
120 to 140	7-1/2	7-1/2	7-1/2	7-1/2	6-1/2	6-1/2	5
140 to 160	7-1/2	7-1/2	7-1/2	7-1/2	7	7	-
160 to 180	8	8	8	8	7 ²	7	-
180 to 200	8-1/2	8-1/2	8-1/2	8-1/2	7-1/2 ²	7-1/2	-
200 to 240	9	9	9	8-1/2	8 ²	8	-
240 to 280	8-1/2 ²	9-1/2	9-1/2	9	8-1/2 ²	8-1/2	-
280 to 320	10 ²	10 ²	10	9-1/2	8-1/2 ²	9	-
320 to 360	10-1/2 ²	10-1/2 ²	10-1/2 ²	10	9 ²	9	-
360 to 400	10-1/2 ²	11 ²	11 ²	10-1/2	9-1/2 ²	9-1/2	-
400 to 440	11 ²	11 ²	-	11 ²	10 ²	9-1/2	-
440 to 480	-	11-1/2 ²	-	11 ²	10 ²	-	-
480 to 520	-	-	-	11-1/2 ²	10-1/2 ²	-	-
520 to 560	-	-	-	-	10-1/2 ²	-	-

¹Lengths are 90-ft. shots. Depth of water is taken at mean high water from a firm bottom at anchor location. Maximum water depth determined on the basis of not exceeding the allowable stress in the chain.

²The freeboard limit of the mooring's standard buoy (see Table 83) will be exceeded at this depth. An optional buoy (see Table 85) must be used.

TABLE 87
Moorings Without Sinkers Chain Set Assemblies for Various Water Depths ¹

Depth of Water (feet)	A			B			C			D			E			F			G		
	2-3/4" chain (90' shot)	2-3/4" chain (45' shot)	2-3/4" Joining Link	2-1/2" chain (90' shot)	2-1/2" chain (45' shot)	2-1/2" Joining Link	2-1/4" chain (90' shot)	2-1/4" chain (45' shot)	2-1/4" Joining Link	2" chain (90' shot)	2" chain (45' shot)	2" Joining Link	1-3/4" chain (90' shot)	1-3/4" chain (45' shot)	1-3/4" Joining Link	1-1/4" chain (90' shot)	1-1/4" chain (45' shot)	1-1/4" Joining Link	3/4" chain (90' shot)	3/4" chain (45' shot)	3/4" Joining Link
Basic :: 50	0	0	0	0	1	1	0	4	4	0	4	4	0	1	4	0	1	4	0	4	4
50 :: 60	0	4	4	0	1	4	0	4	4	0	4	4	0	1	4	0	1	4	0	4	4
60 :: 70	0	4	4	0	1	4	0	4	4	0	4	4	0	1	4	0	1	4	0	4	4
70 :: 80	0	4	4	0	1	4	0	4	4	0	4	4	0	1	4	0	1	4	0	4	4
80 :: 90	0	4	4	0	1	4	0	4	4	0	4	4	0	1	4	0	1	4	0	4	4
90 :: 100	0	4	4	0	1	4	0	4	4	0	4	4	0	1	4	0	1	4	0	4	4
100 :: 120	0	4	4	0	1	4	0	4	4	0	4	4	0	1	4	0	1	4	0	4	4
120 :: 140	0	4	4	0	1	4	0	4	4	0	4	4	0	1	4	0	1	4	0	4	4
140 :: 160	0	4	4	0	1	4	0	4	4	0	4	4	0	1	4	0	1	4	0	4	4
160 :: 180	0	4	4	0	1	4	0	4	4	0	4	4	0	1	4	0	1	4	0	4	4
180 :: 200	0	4	4	0	1	4	0	4	4	0	4	4	0	1	4	0	1	4	0	4	4
200 :: 240	0	4	4	0	1	4	0	4	4	0	4	4	0	1	4	0	1	4	0	4	4
240 :: 280	0	4	4	0	1	4	0	4	4	0	4	4	0	1	4	0	1	4	0	4	4
280 :: 320	0	4	4	0	1	4	0	4	4	0	4	4	0	1	4	0	1	4	0	4	4
320 :: 360	0	4	4	0	1	4	0	4	4	0	4	4	0	1	4	0	1	4	0	4	4
360 :: 400	0	4	4	0	1	4	0	4	4	0	4	4	0	1	4	0	1	4	0	4	4
400 :: 440	0	4	4	0	1	4	0	4	4	0	4	4	0	1	4	0	1	4	0	4	4
440 :: 480	0	4	4	0	1	4	0	4	4	0	4	4	0	1	4	0	1	4	0	4	4
480 :: 520	0	4	4	0	1	4	0	4	4	0	4	4	0	1	4	0	1	4	0	4	4
520 :: 560	0	4	4	0	1	4	0	4	4	0	4	4	0	1	4	0	1	4	0	4	4

¹Add :: Basic Depth Assembly to obtain Assembly for a particular depth

TABLE 88
Moorings With Sinkers - Bills of Materials

Class	A	B	C	D	E
Holding Power (lbs.)	150,000	125,000	100,000	75,000	50,000
Basic Depth (ft.)	50	45	40	35	35
Assembly No.	5015	5254	5220	5231	5224
Description of Item	Reqd. Size	Reqd. Size	Reqd. Size	Reqd. Size	Reqd. Size
Riser buoy	1 dia.	1 dia.	1 dia.	1 dia.	1 dia.
	12'0"	12'0"	10'6"	10'6"	9'6"
	hgt.	hgt.	hgt.	hgt.	hgt.
	6'0"	6'0"	7'6"	6'6"	5'0"
Anchors	3 --1	3 --1	3 --1	3 --1	3 --1
Chain Set Assembly No.	1 5766	1 5764	1 5763	1 5741	1 5758
Sinkers	3 8,200	3 8,200	3 8,200	3 8,200	3 8,200
	(lbs.)	(lbs.)	(lbs.)	(lbs.)	(lbs.)

¹For anchor selection procedure, see introduction to this part.

TABLE 89
Mooring With Sinkers - Chain Set Assembly for Basic Depth

Class	A		B		C		D		E	
	Chain Set	5766	Reqd.	Spare ¹	Chain Size	Chain Spare ¹	Reqd.	Spare ¹	Chain Size	Chain Spare ¹
Assembly No.		5764								
Basic Depth		45								
(ft.)										
Description										
Of item										
Riser chain	1	2-3/4	1	-	2-1/2	1	2-1/4	1	2	1-3/4
(45 ft.) ²										
Ground chain	12	2-3/4	12	-	2-1/2	9	2-1/4	9	2	1-3/4
(90 ft.) ²										
Ground chain	0	2-3/4	0	-	2-1/2	3	2-1/4	0	2	1-3/4
(45 ft.) ²										
Ground ring	1	2-3/4	1	-	2-1/2	1	2-1/4	1	2	1-3/4
End link	1	2-3/4	1	-	2-1/2	1	2-1/4	1	2	1-3/4
F-shackle	-	-	-	-	-	-	-	-	-	1-3/4
without lugs										
F-shackle	1	2-3/4	1	1	2-1/2	1	2-1/4	1	2	-
with lugs										
Anchor Joining	8	2-3/4	11	2	2-1/2	11	2-1/4	11	2	1-3/4
link										
Joining link	16	2-3/4	14	6	2-1/2	13	2-1/4	10	2	1-3/4
Swivel	4	2-3/4	4	-	2-1/2	4	2-1/4	4	2	1-3/4
Rubbing	1	2-3/4	1	-	2-1/2	-	-	-	-	-
casting										
Sinker shackle	3	2"to3"	3	-	2"to3"	3	2"to3"	3	2"to3"	2"

¹Ship to advanced bases for each Assembly regardless of water depth.

²If still in stock, a swivel chain shot of the same size may be substituted in the riser or ground chain for the listed swivel and chain shot. Each swivel chain shot will replace 1 chain shot. 1 swivel, and 1 chain joining link in the Bill of Materials.

TABLE 90
Mooring With Sinkers - Maximum Mooring Depths With Various Buoys

Buoy Details	NAVFAC Dwg. 620659	NAVFAC Dwg. 620659	NAVFAC Dwg. 620659	NAVFAC Dwg. 620605	NAVFAC Dwg. 620659
Size	bar type Dia. Hgt. 9'6" x 5'0"	bar type Dia. Hgt. 10'6" x 6'6"	hawsepole type Dia. Hgt. 12'0" x 6'0"	bar type Dia. Hgt. 10'6" x 7'6"	
Class	Depth (ft.) ¹				
A	-	-	225	-	-
B	-	-	280	-	-
C	80	305	-	425	
D	105	395	-	545	
E	150	525	-	-	

¹Buoys have a 2-ft. freeboard at depth tabulated.

TABLE 91
Moorings With Sinkers - Lengths of Ground Chain Required for Various Water Depths¹

Depth of Water (ft.)	Class				
	A	B	C	D	E
Basic	4	4	3-1/2	3	3
Basic to 50	4	4	4	3-1/2	3-1/2
50 to 60	4-1/2	4-1/2	4-1/2	4	3-1/2
60 to 70	4-1/2	4-1/2	4-1/2	4	4
70 to 80	5	5	5	4-1/2	4
80 to 90	5-1/2	5-1/2	5-1/2	5	4-1/2
90 to 100	5-1/2	5-1/2	5-1/2	5	5
100 to 120	6	6	6	5-1/2	5-1/2
120 to 140	6-1/2	6-1/2	6-1/2	6	5-1/2
140 to 160	7	7	7	6-1/2	6
160 to 180	7-1/2	7-1/2	7-1/2	7	6-1/2 ²
180 to 200	7-1/2	7-1/2	7-1/2	7	6-1/2 ²
200 to 240	8	8	8	7-1/2	7 ²
240 to 280	9 ²	9	8-1/2	8	7 ²
280 to 320	9-1/2 ²	9-1/2 ²	9	8-1/2	7-1/2 ²
320 to 360	10 ²	10 ²	9-1/2	9	8 ²
360 to 400	-	10-1/2 ²	10	9-1/2	8 ²
400 to 440	-	11 ²	10-1/2	10 ²	8-1/2 ²
440 to 480	-	-	-	10-1/2 ²	9 ²

¹Lengths are 90-ft. shots. Depth of water is taken at mean high water from a firm bottom at anchor location. Maximum water depth determined on the basis of not exceeding the allowable stress in the chain.

²The freeboard limit of the mooring's standard buoy will be exceeded at this depth. An optional buoy must be used.

TABLE 92
Mooring With Sinkers - Chain Set Assemblies for Various Depths¹

Depth of Water (feet)	Class														
	A			B			C			D			E		
	2-3/4" chain (90' shot)	2-3/4" chain (45' shot)	Joining Link	2-1/2" chain (90' shot)	2-1/2" chain (45' shot)	Joining Link	2-1/4" chain (90' shot)	2-1/4" chain (45' shot)	Joining Link	2" chain (90' shot)	2" chain (45' shot)	Joining Link	1-3/4" chain (90' shot)	1-3/4" chain (45' shot)	Joining Link
Basic to 100	0	0	0	0	1	1	0	4	4	0	4	4	0	4	4
50 to 100	0	4	4	0	4	4	3	1	4	3	1	4	0	4	4
60 to 100	0	4	4	0	4	4	3	1	4	3	1	4	3	1	4
70 to 100	3	1	4	3	1	4	3	4	7	3	4	7	3	1	4
80 to 100	3	4	7	3	4	7	7	0	7	7	0	7	4	3	7
90 to 100	4	3	7	4	3	7	7	0	7	7	0	7	7	0	7
100 to 110	7	0	7	7	0	7	7	3	10	7	3	10	7	3	10
120 to 140	7	3	10	7	4	11	10	1	11	10	1	11	7	4	11
140 to 160	10	1	11	10	1	11	10	4	14	10	4	14	10	1	11
160 to 180	10	4	14	10	4	14	14	0	14	14	0	14	11	3	14
180 to 200	11	3	14	11	3	14	14	0	14	14	0	14	11	3	14
200 to 220	14	1	15	14	1	15	14	4	18	14	4	18	14	1	15
240 to 260	18	0	18	18	0	18	18	0	18	18	0	18	15	0	15
280 to 300	18	3	21	18	4	22	18	4	22	18	4	22	15	4	19
320 to 340	21	1	22	21	1	22	22	0	22	22	0	22	19	0	19
360 to 380	-	-	-	22	3	25	22	3	25	22	4	25	19	1	20
400 to 420	-	-	-	25	1	26	25	1	26	25	1	26	19	4	23
440 to 460	-	-	-	-	-	-	-	-	-	26	3	29	23	0	23

¹Add to Basic Depth Assembly to obtain Assembly for a particular depth.

NOTES

In special situations, other fittings (than those shown) may be necessary to connect the anchor and ground chain if the swivel shackle is the wrong size for the anchor's shackle.

REFERENCES

Title	Reference
Bills of Materials	Table 79
Chain Set Assembly for Basic Depth	Table 80
Lengths of Ground Chain between Anchor and Spider for Various Water Depths	Table 81
Chain Set Assemblies for Depths greater than Basic	Table 82
Buoy Details	NAVFAC dwg 1404065
Chain and Fitting Details	Sections 4 and 6
Anchor Details	Sections 4, 5, and 6

CLASS	CHAIN	FITTINGS
AAA	ABS GRADE 3	
BBB	ABS GRADE 2	

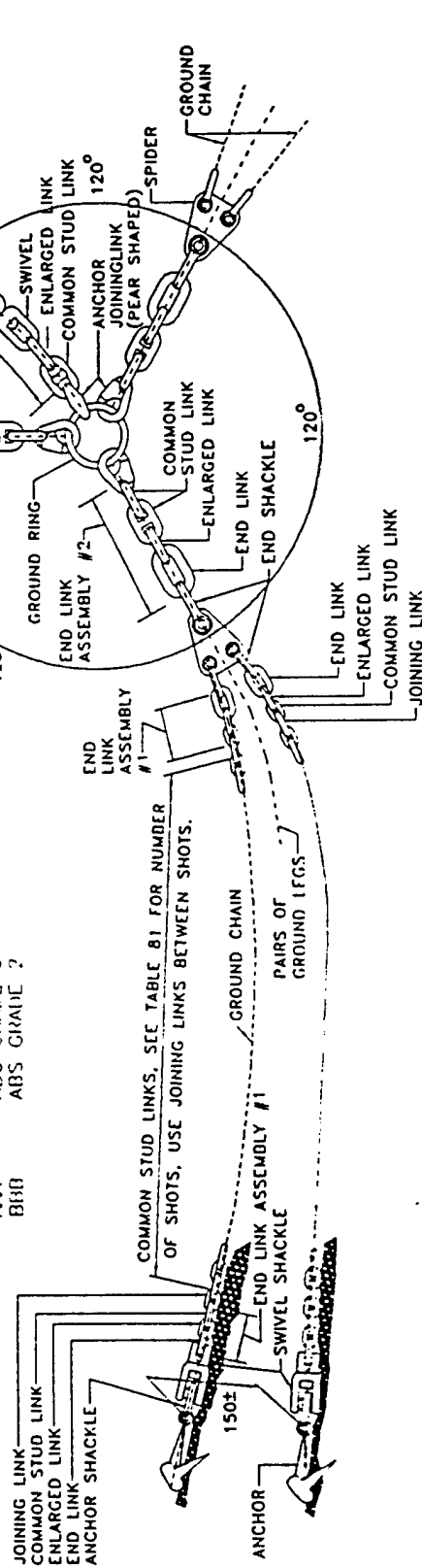
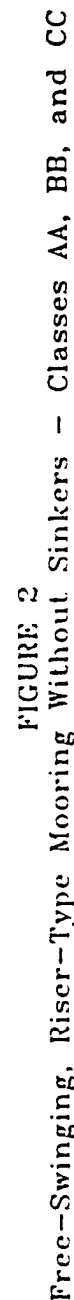


FIGURE 1
Free-Swinging, Riser-Type Mooring Without Sinkers - Classes AAA and BBB (Proposed)

In special situations, other fittings (than those shown) may be required to connect the anchor and ground chain if the anchor connecting link is the wrong size for the anchor's shackle.

Title	Reference
Bills of Materials	Table 79
Chain Set Assembly for Basic Depth	Table 80
Lengths of Ground Chain between Anchor and Spider for Various Water Depths	Table 81
Chain Set Assemblies for Depths greater than Basic Buoy Details	Table 82
Chain and Fitting Details	NAVFAC dwg 620,605
Anchor Details	Sections 4 and 6 Sections 4, 5, and 6

ALL CHAIN IS U.S. NAVY
COMMON A-LINK



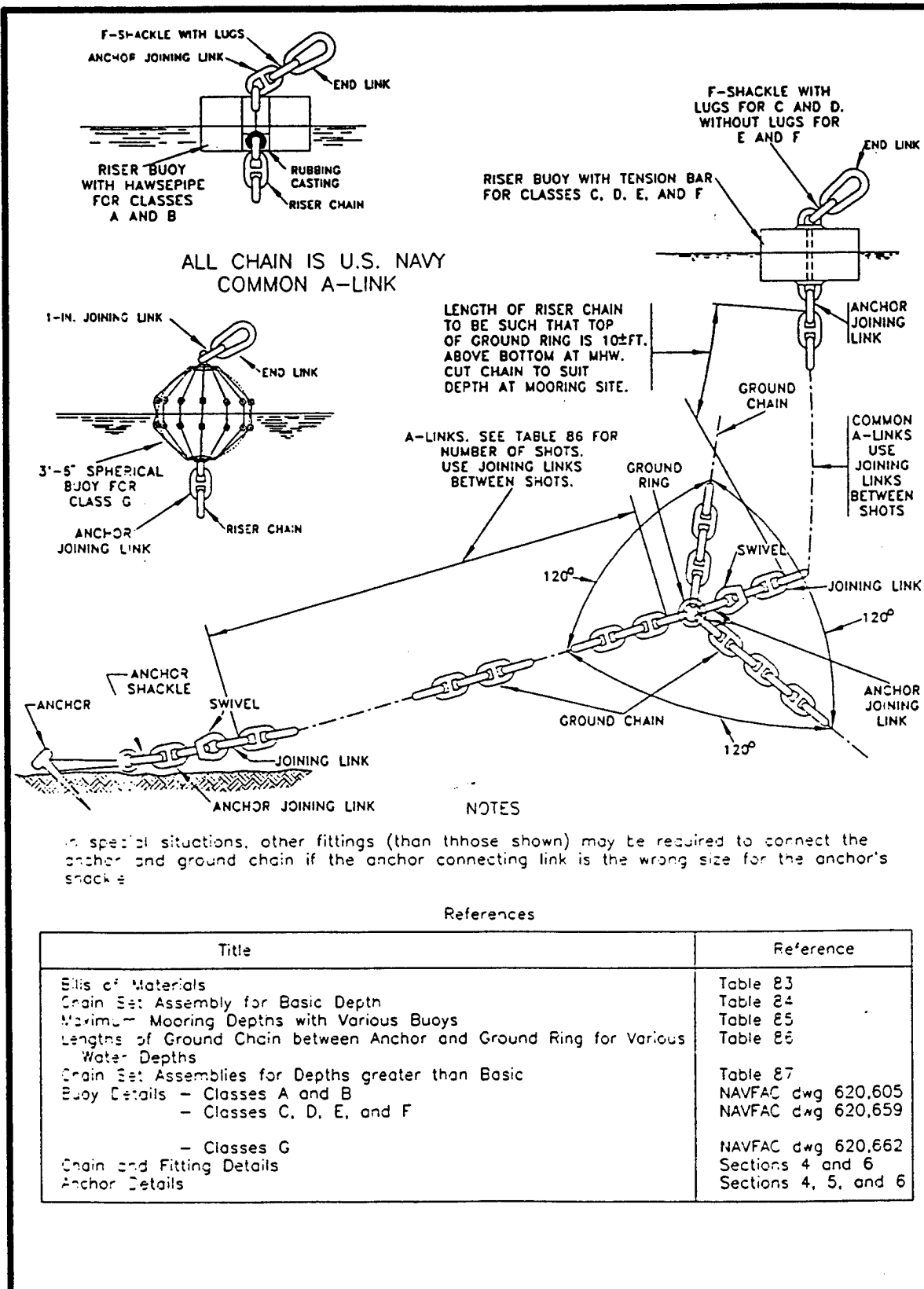


FIGURE 4
Free-Swinging, Riser-Type Mooring Without Sinkers - Classes A, B, C, D, E, F, and G

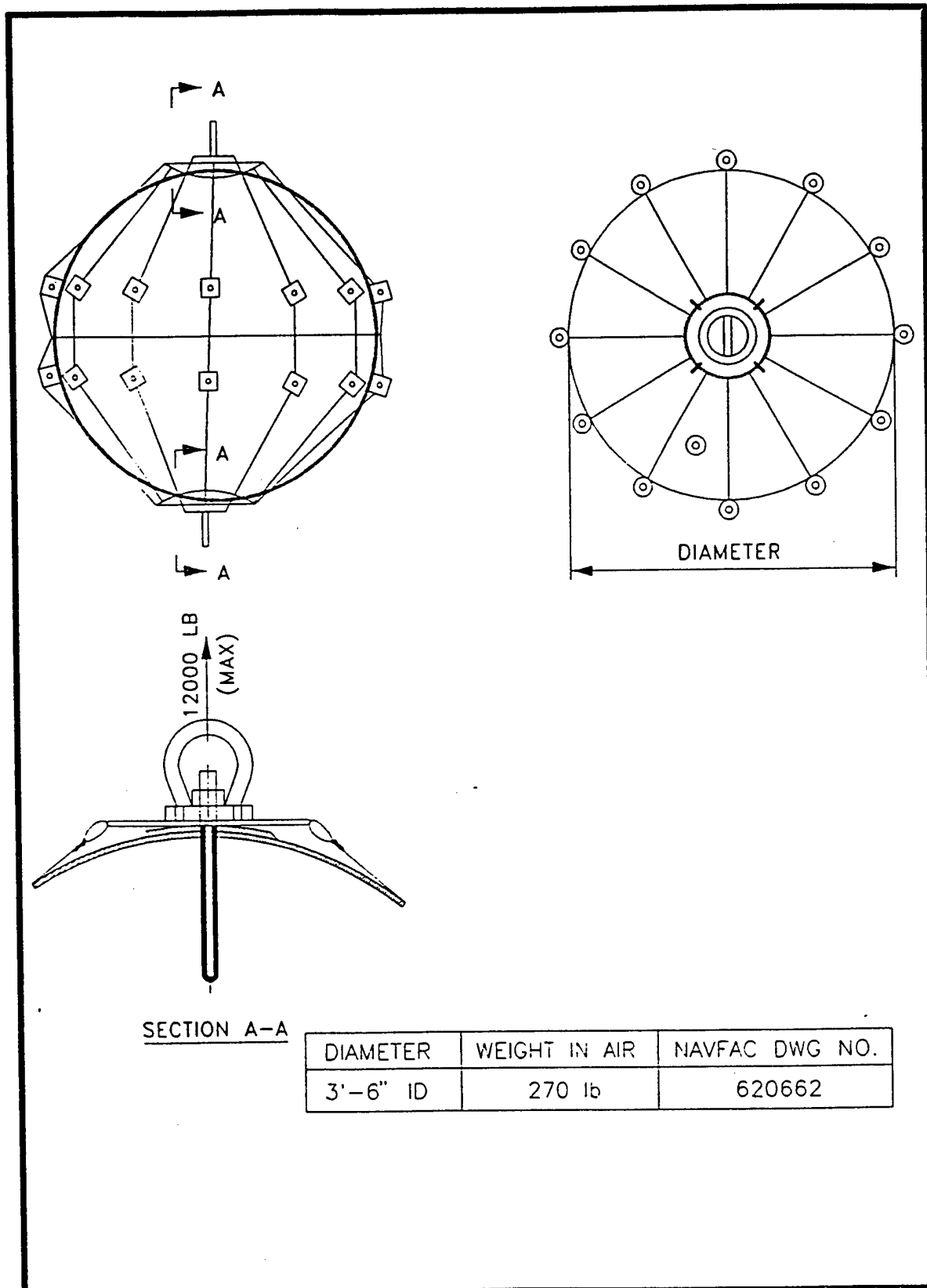


FIGURE 9
Standard Marker or Mooring Buoy

DIAMETER	HEIGHT	WEIGHT IN AIR	NAVFAC DWG NO.
9'-6" O D	5'-0"	7,700 lbs	620,659
12'-6" O D	6'-6"	9,600 lbs	620,659
15'-6" O D	7'-6"	10,100 lbs	620,659

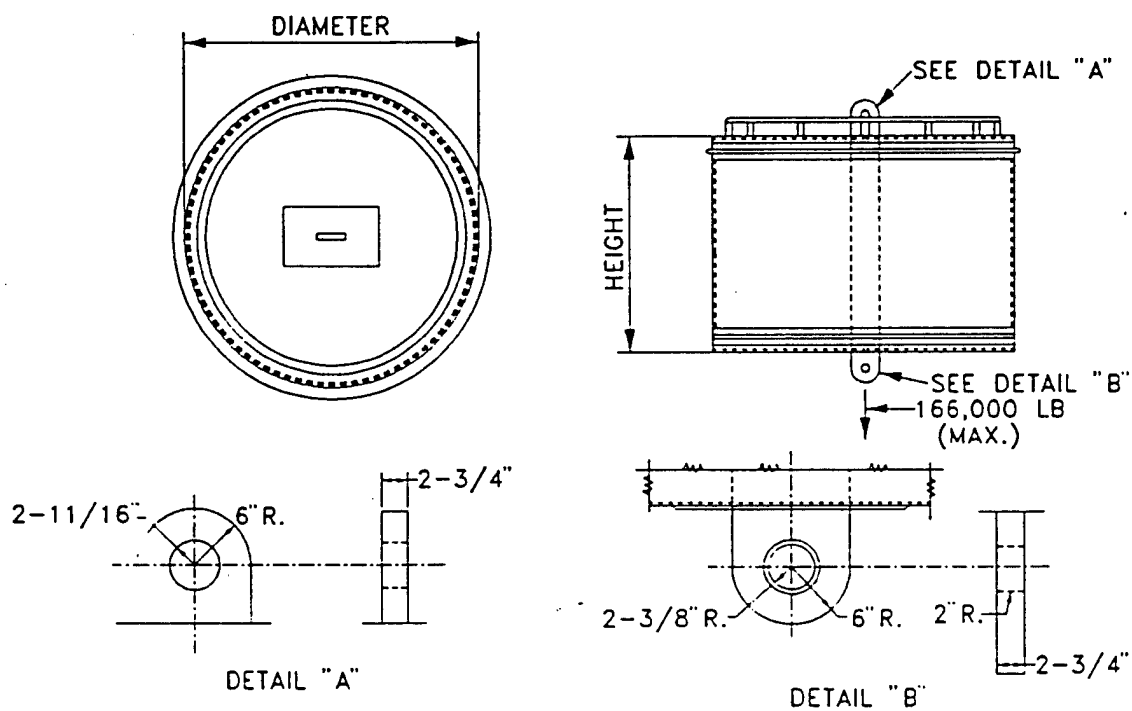


FIGURE 10
Tension Bar Mooring Buoy

DIAMETER	HEIGHT	WEIGHT IN AIR	NAVFAC DWG NO.
12'-0" O D	6'-0"	11,300 lbs	620,605

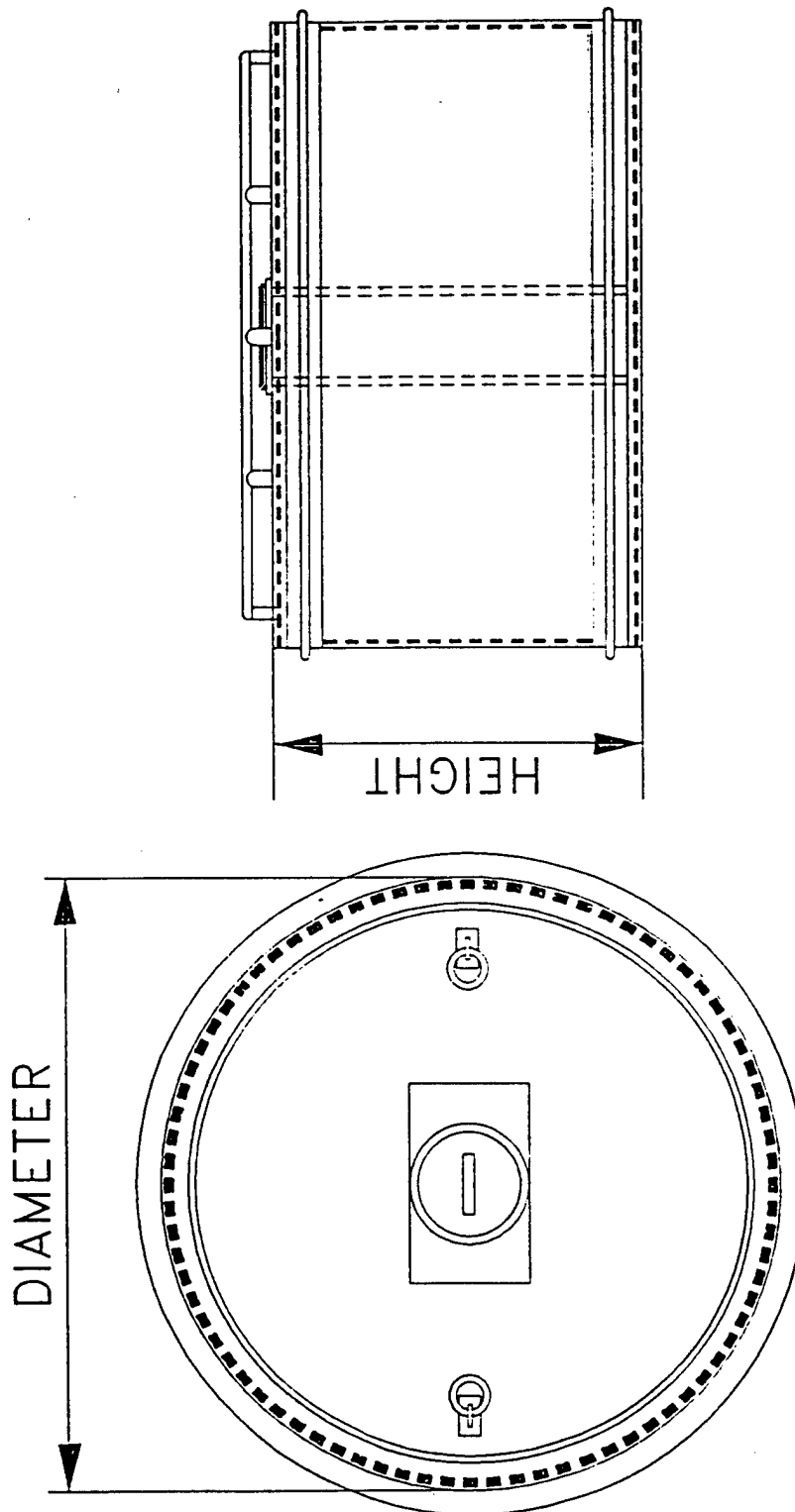


FIGURE 11
Hawsepipe Mooring Buoy

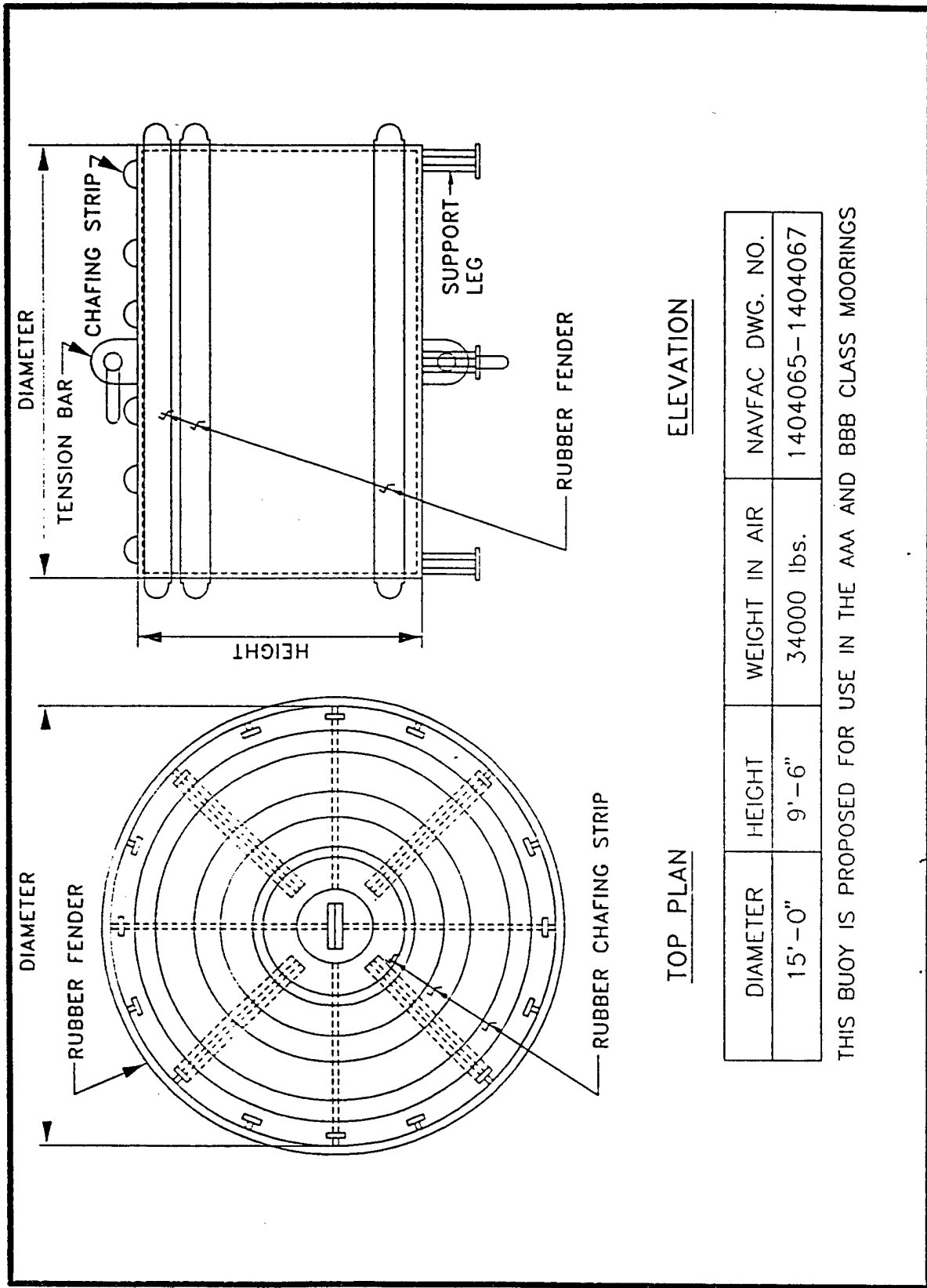
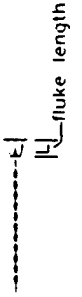
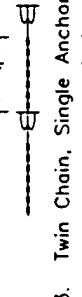




FIGURE 12
Tension Bar Mooring Buoy

TABLE 2
Recommended NAVMORR Anchor Size^a for Navy Fleet Moorings

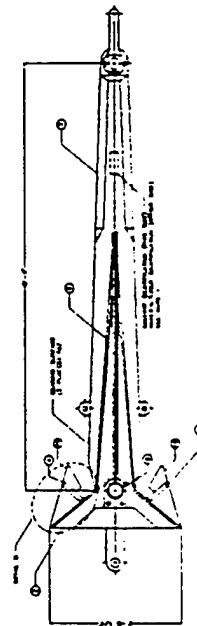
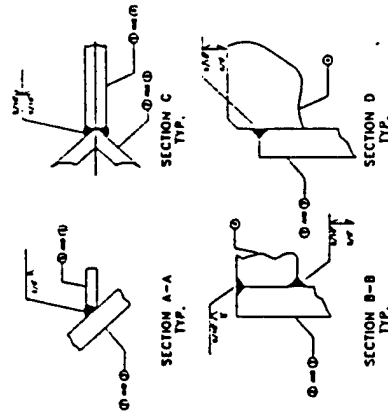
Mooring Class	Mooring Capacity (kips)	Anchor Weight (Nominal) for Ground Leg Options (lb)			
		1. Single Chain, Single Anchor	2. Single Chain, Tandem Anchor	3. Twin Chain, Single Anchor	4. Twin Chain, Tandem Anchor
					
		Mud ^c	Sand ^d	Mud	Sand
AAA	500				
BBB	400				
AA	300				
BB	250				
CC	200				
DD	175				
A	150				
B	125				
C	100				

^aRecommended anchor sizes provide system factor of safety of 1.75 to 2.25

^bMinimum anchor separations related to fluke length (L).

^cIncludes very soft to soft silt and clay seafloors

^dIncludes sands and medium to stiff clay seafloors.

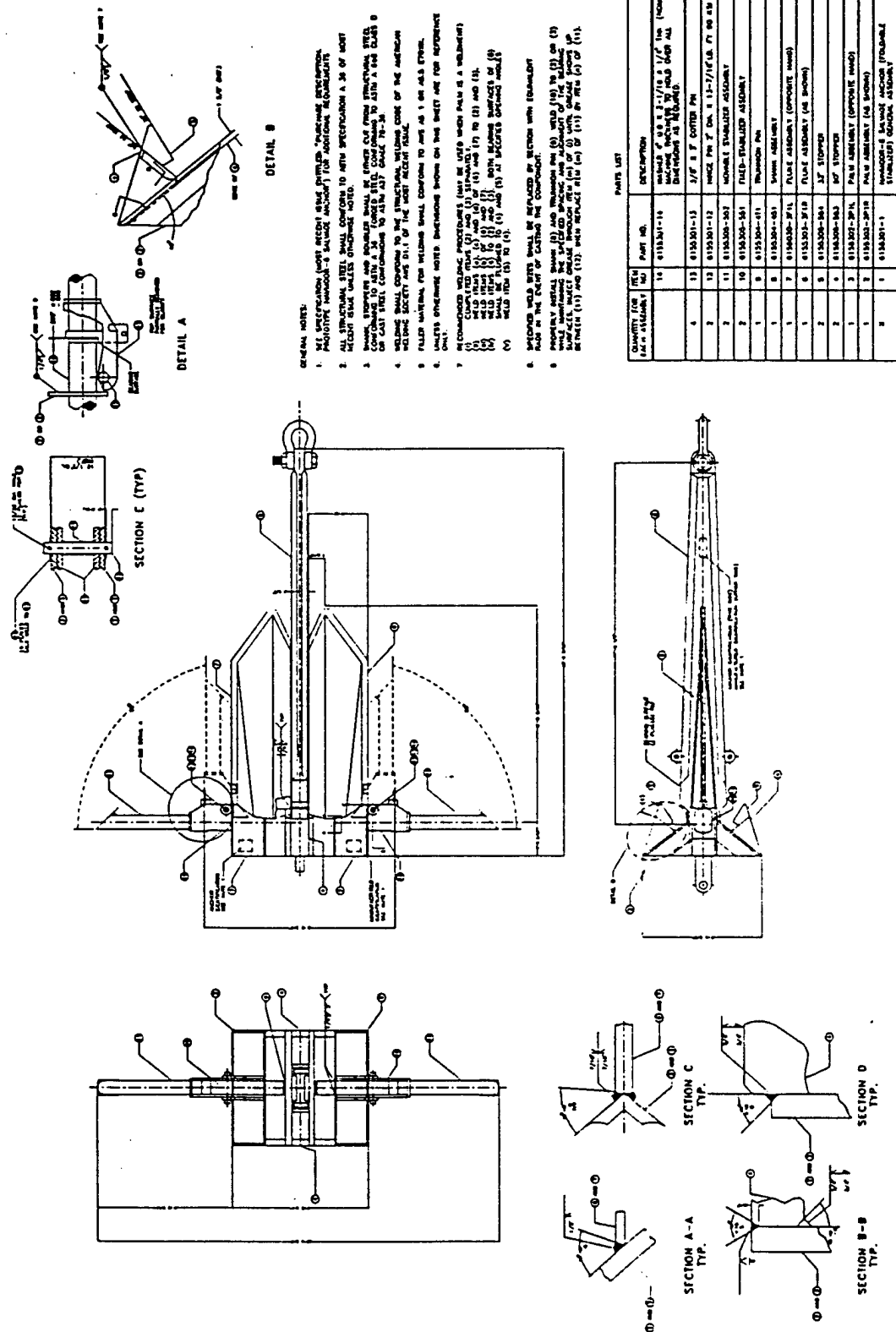


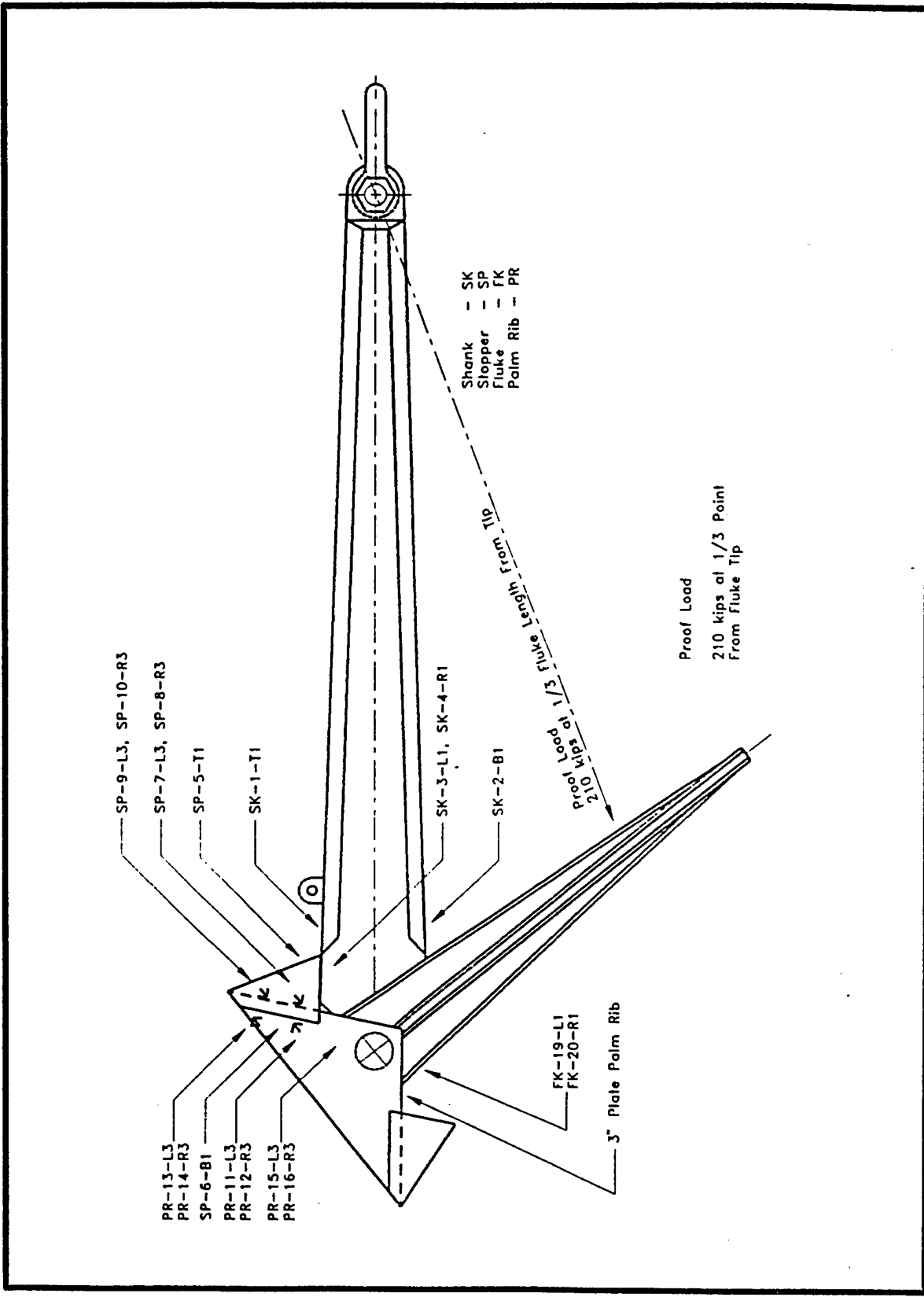
QUANTITY (AS SHOWN ON EACH ASSAULT)	UNIT	PART NO.	DESCRIPTION
2	NO	0153117-232	17 STOPPER
2	8	0153117-042	16mm/20mm ASSAULT
1	8	0153117-011	PERMANENT ADDRESS
1	7	0153117-491	SPRINT 4911 ONLY
1	6	0153118-211	FLAME ASSAULT (OPPOSITE HAND)
1	8	0153118-210	FLAME ASSAULT (AS BEFORE)
2	6	0153118-201	16/ STOPPER
1	3	0153118-201	FLAME ASSAULT (OPPOSITE HAND)
2	6	0153118-2010	FLAME ASSAULT (AS BEFORE)

[illegible]

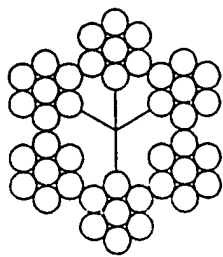
NAVMOOR-2 Mooring Anchor
2,400 lbs. (wt.)
General Assembly

General Assembly

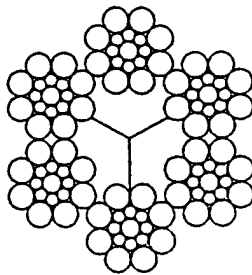
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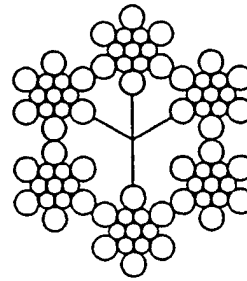
10K Navmoor Anvhor
Plan View



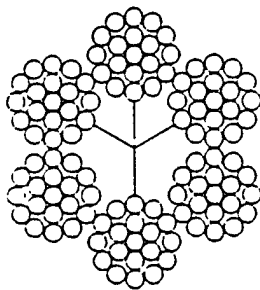
6 X 7



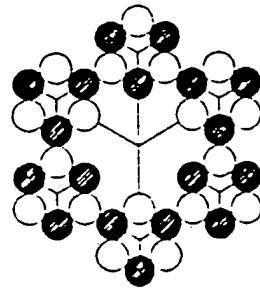
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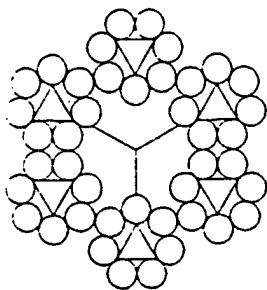
6 X 19



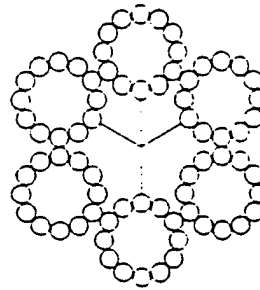
6 X 19



6 X 3 X 19



6 X 8



6 X 12

FIGURE 613-6
Common Wire Rope Construction Examples

TABLE 613-6
Fiber Rope Specification

Type of Rope	Circumference Inches	Specifications
Untreated Manila	Up to 12	FED Spec T-R--6-5
Mildew Resistant Manila	Up to 12	FED Spec T-T-616
Jute	5/8 to 6	FED Spec T-R-650
Polypropylene	Up to 10	MIL-R-24049
Nylon Three Strand	Up to 12	MIL-R-17343
Nylon Plaited	up to 16	MIL-R-24337
Nylon Double Braid	Up to 21	MIL-R-204050
Polyester Three Strand	Up to 12	MIL-R-30500
Polyester Plaited (Staple Wrap)	3/4 to 4-1/2	MIL-R-24537
Polyester Double-Braid	Up to 21	MIL-R-24677
Polyester Double-Braid (Staple Wrap)	3/4 to 5	MIL-R-24536

TABLE 613-8
Plain-Laid Rope Construction

Size Circumference Inches	Minimum Breaking Strength (Lbs) ¹				
	Sisal	Manila	Polypropylene	Nylon ²	Polyester
5/8	360	405	700	950	800
3/4	480	540	1,000	1,500	1,200
1	800	900	1,700	2,600	2,000
1-1/8	1,080	1,215	2,150	3,300	2,800
1-1/4	1,400	1,525	2,500	4,800	3,800
1-1/2	2,120	2,385	3,700	5,800	5,000
1-3/4	2,760	3,105	4,800	7,600	6,500
2	3,520	3,960	6,000	9,800	8,000
2-1/4	4,320	4,860	7,000	13,200	10,000
2-1/2	5,200	5,850	9,000	15,300	13,000
2-3/4		6,930	11,000	19,000	15,000
3		8,100	13,000	23,200	18,500
3-1/2		10,800	16,500	32,000	25,000
3-3/4		12,150	19,500	36,500	
4		13,500	21,500	41,300	31,000
4-1/2		16,650	26,000	50,000	
5		20,250	32,000	60,000	48,000
4-1/2		23,850	38,000	72,000	
6		27,900	44,000	90,000	68,000
6-1/2			50,000	100,000	
7		36,900	60,000	127,000	88,000
8		46,800	75,000	164,000	110,000
9		57,600	94,000	209,000	140,000
10		69,300	115,000	265,000	165,000
11		81,900		316,000	240,000
12		94,500		375,000	285,000

NOTE:
¹Comparative strengths of various fiber ropes.
²The minimum breaking strength of nylon when wet is reduced approximately 15 percent.

TABLE 613-9
Braided Rope Construction

Size Circumference Inches	Minimum Breaking Strength (lbs.)		
	Double Braided		Plaited
	Nylon	Polyester	Nylon
3/4	1,700	1,730	1,500
1	2,700	2,670	2,500
1-1/8	3,900	3,860	3,700
1-1/4	5,100	5,210	5,000
1-1/2	6,900	6,820	6,400
1-3/4	9,000	8,590	8,000
2	12,000	10,600	11,000
2-1/4	15,000	15,100	17,000
2-1/2	18,400	17,800	20,000
2-3/4	22,500	20,600	24,000
3	26,500	26,800	31,000
3-1/2	36,000	33,900	38,000
3-3/4	42,000	41,700	46,000
4	48,000	46,000	53,000
4-1/2	60,000	59,900	63,000
5	73,000	69,900	73,000
5-1/2	90,000	81,200	78,000
6	102,000	106,000	95,000
6-1/2	123,000	119,000	106,000
7	140,000	133,000	125,000
7-1/2	160,000	164,000	137,000
8	180,000	181,000	165,000
9	225,000	236,000	200,000
10	273,000	277,000	250,000
11	325,000	343,000	300,000
12	385,000	417,000	360,000

TABLE 613-9
Braided Rope Construction - Continued

Size Circumference Inches	Minimum Breaking Strength (Lbs) ¹		
	Double Braided		Plaited
	Nylon ²	Polyester	Nylon ²
13	440,000	470,000	380,000
14	508,000	527,000	441,000
15	576,000	649,000	507,000
16	650,000	715,000	572,000
17	726,000	784,000	
18	808,000	931,000	
19	893,000	1,012,000	
20	980,000	1,091,000	
21	1,070,000	1,263,000	

NOTE:

¹Comparative strengths of various fiber ropes for current minimum breaking strength of each type, consult the MIL-Spec.

²The minimum breaking of nylon when wet is reduced approximately 15 percent.

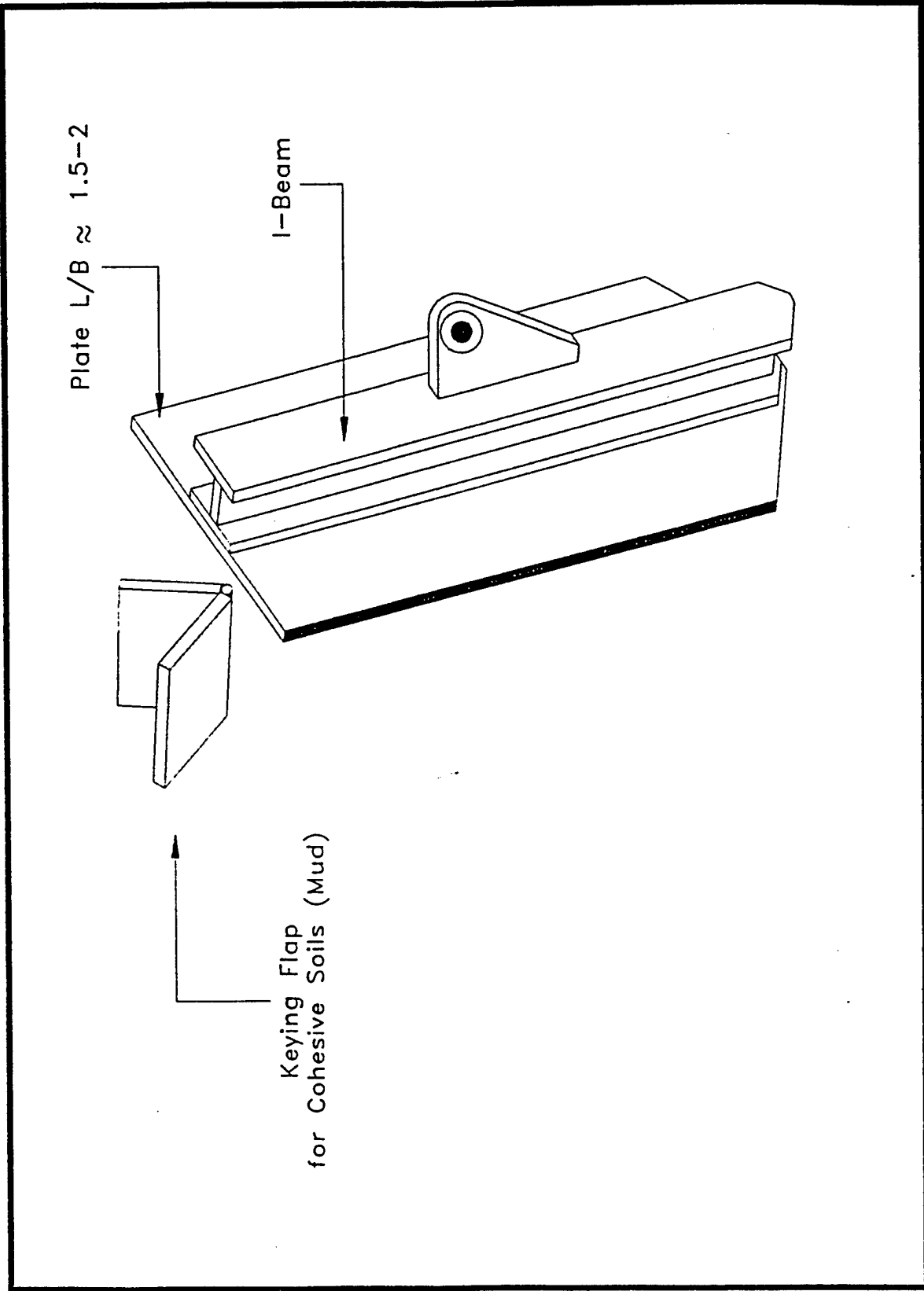
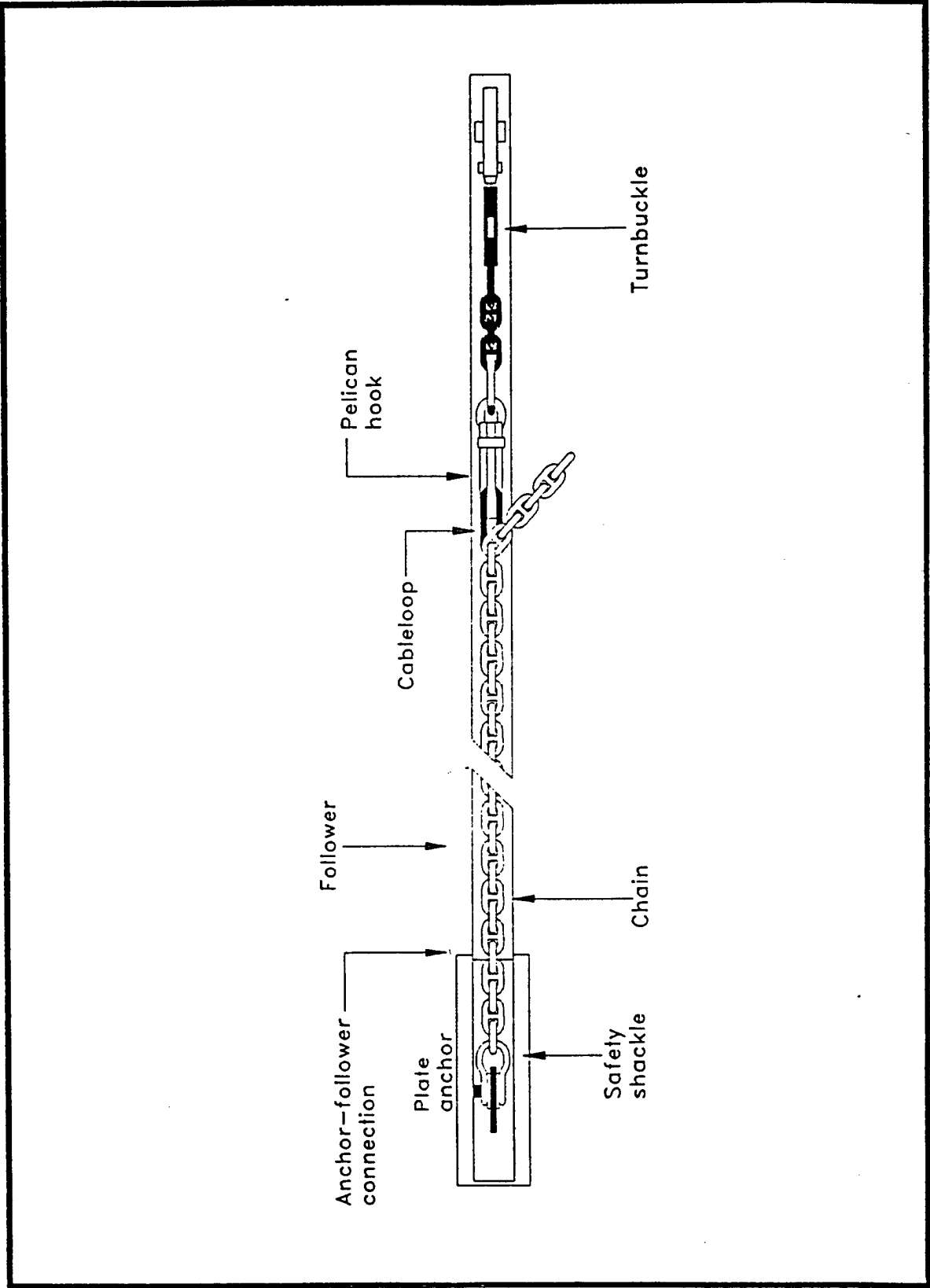


FIGURE 3
Driven Plate Anchor Configuration



Anchor-Follower Assembly

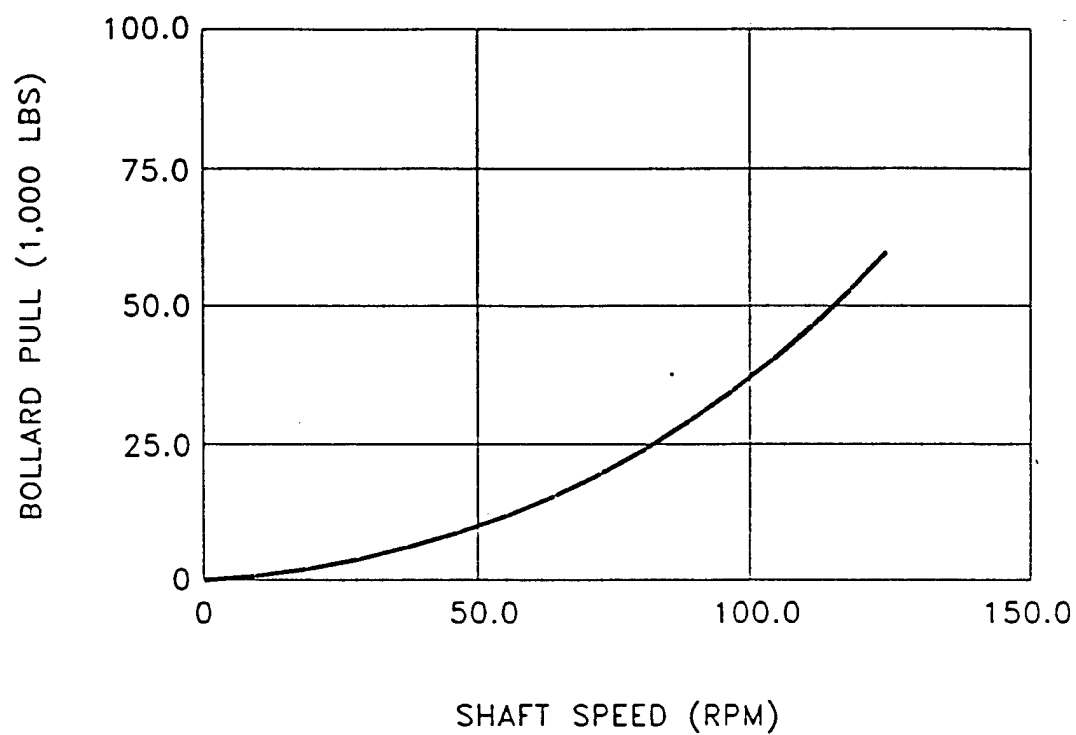


FIGURE J-1
Variation of Bollard Pull with Shaft Speed for ARS-38 Class Ships

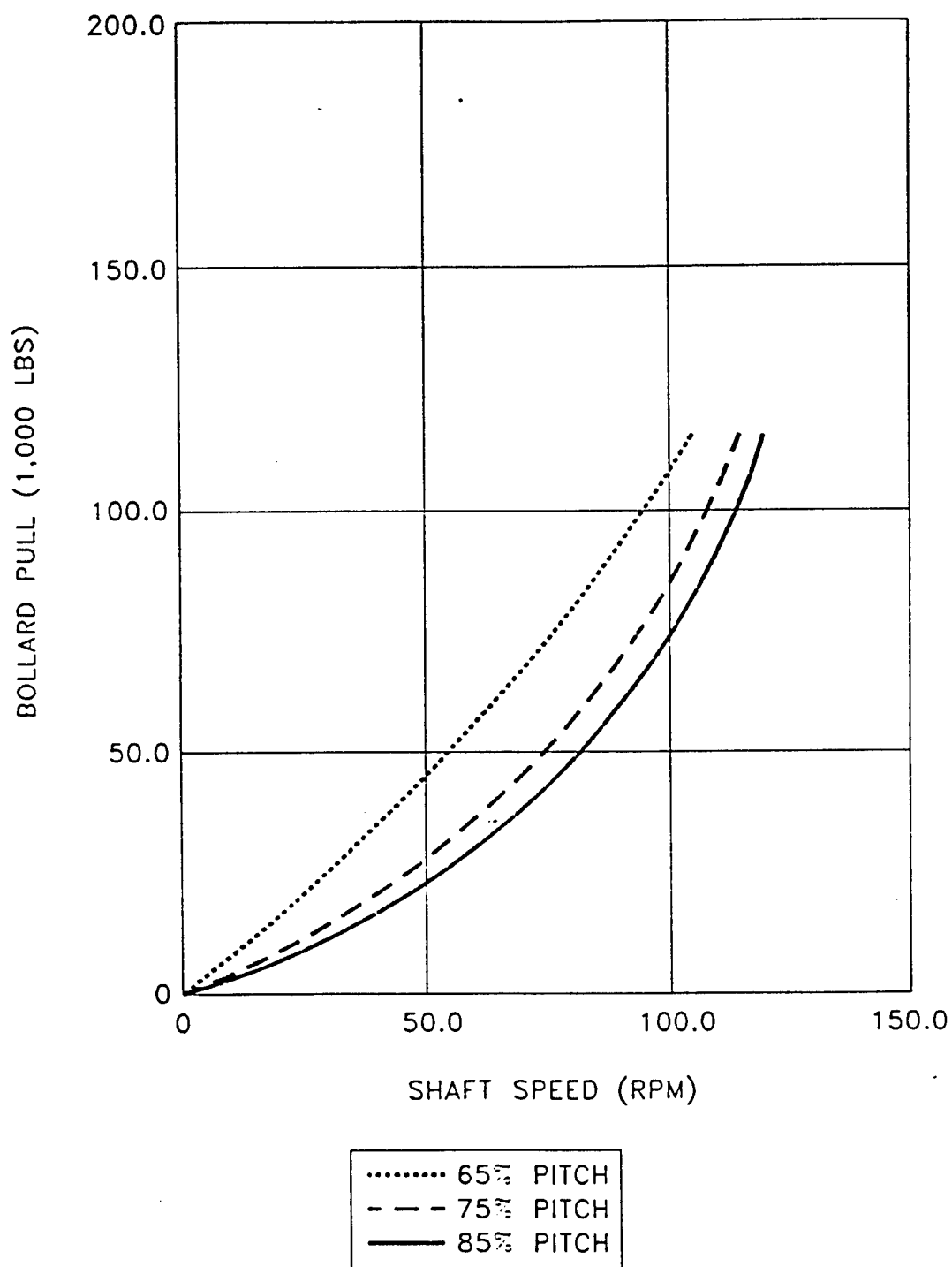
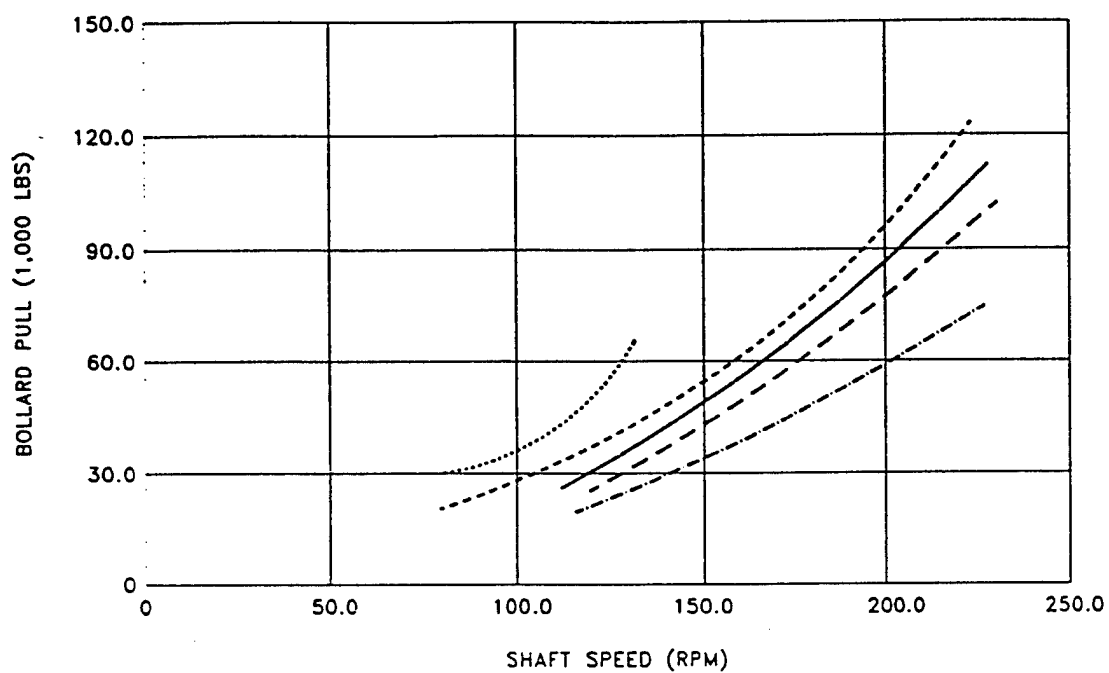


FIGURE J-2
Variation of Bollard Pull with Shaft Speed and Propeller Pitch for ARS-50 Class Ships



NOTE:
These performance curves are not typical of
all T-ATF-169 Class tugs. Some ships of
this class are fitted with Kort nozzles.

PITCH (FT)	
---	6.5
- - -	8.0
—	9.0
.....	10.0
— · — · —	12.5

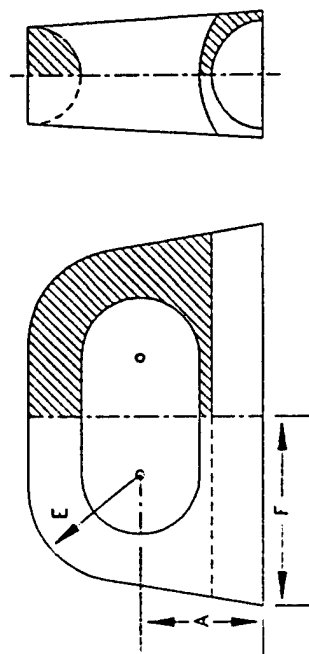
FIGURE J-3
Bollard Pull vs. Shaft Speed and Propeller Pitch
For T-ATF-169 Class Ship Without Kort Nozzle

TABLE 1
Chocks for Nylon Rope (4)

Chock size		Breaking strength of rope		A		E		F		Chock weight	
in.	mm	lb	kN	in.	mm	in.	mm	in.	mm	lb	kg
6	152	22,000	98	4-1/2	114	3-5/8	92	6-1/2	165	50	23
8	203	37,500	167	5-1/2	140	4-1/2	114	8	203	80	36
10	254	54,400	242	6	152	5-1/4	133	9-1/2	241	120	54
12	305	74,000	329	7	178	6	152	11	279	180	82
14	356	110,000	489	8	203	6-3/4	171	12	305	230	104
16	406	137,000	609	9	229	7-3/4	197	14	356	360	163
18	475	170,000	756	10	254	8-1/2	216	15	381	470	213
20	508	200,000	890	10-1/2	267	9-1/4	235	16	406	550	249

Notes

1. Chock shall be set parallel to baseline athwarships and shall follow sheer in force and aft direction.
2. Chock is designed for use with nylon rope as shown in table. Chock shall withstand a horizontal endwise pull equal to double the minimum breaking strength of 2 parts of the specified size of nylon rope applied one inch above the centerline of the chock. The chock shall also withstand an upward load of 50,000 pounds applied at its midpoint.



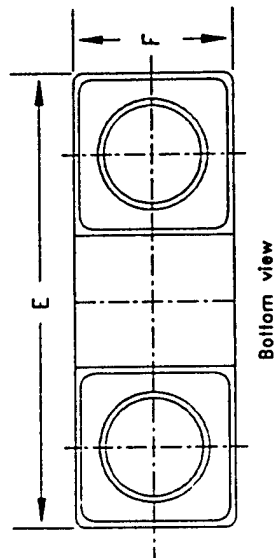
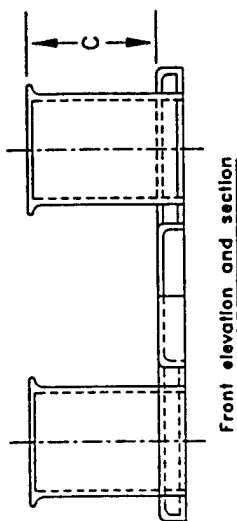
(4) NAVSHIPS Drawing 805-1843363, Chocks for nylon rope.

TABLE 2
Bitts for Nylon Rope (5)

Nominal bit size	Maximum size of nylon rope		Maximum allowable moment		C		E		F		Approximate weight	
	in.	mm	in.-lb (000)	kNm	in.	mm	in.	mm	in.	mm	lb	kg
4	102	89	142.5	16.10	10	254	16-1/2	419	7-1/2	191	80	36
6	152	152	481.0	54.35	13	330	24-1/8	613	11-1/8	283	210	95
8	203	178	770.0	87.00	14	355	30-5/8	778	13-5/8	346	320	145
10	254	228	1490.0	168.35	17	432	39-1/4	997	17-1/4	438	580	263
12	305	254	2110.0	238.40	21	533	45-1/4	1150	20-1/4	514	870	395

Notes

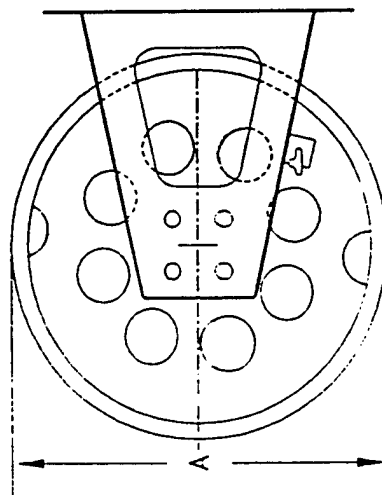
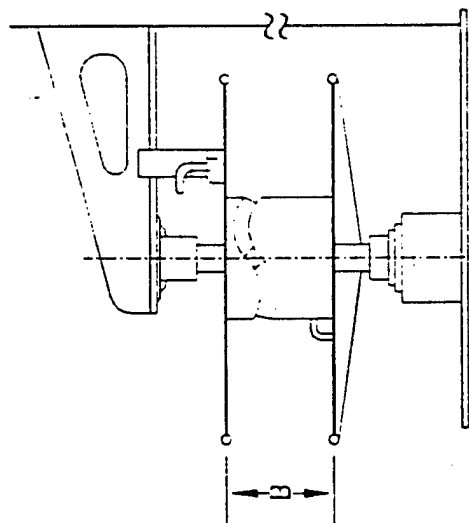
1. The maximum moment is the product of the breaking strength of the rope times half the height of the barrel above the base plate.
2. Bitts are designed for a yield stress of 24,000 lb/in² based on the maximum moment.



(5) NAVSHIPS Drawing 804-184362, Bitts for nylon rope.

TABLE 3
Vertical Howser Reels (6)

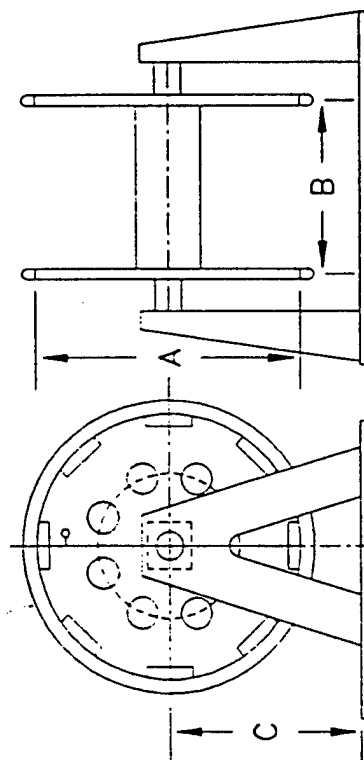
Reel type	Rope size		Capacity	A		B		Approx assy weight		Approx rope weight	
	in.	mm		in.	mm	in.	mm	lb	kg	lb	kg
I	6	152	100	30	762	72	1829	285	129	648	294
	6	152	120	30	762	72	1829	285	129	778	353
	7	178	100	30	762	72	1829	285	129	876	397
II	7	178	120	34	864	66	1676	325	147	1050	476
	8	203	80	34	864	66	1676	325	147	935	424
III	8	203	100	38	965	66	1676	400	181	1128	512
	8	203	120	38	965	66	1676	400	181	1352	613
	10	254	80	38	965	66	1676	400	181	1440	653
IV	10	254	100	45	1143	66	1676	460	209	1798	816
V	10	254	120	50	1270	66	1676	510	231	2154	977



(6) NAVSHIPS Drawings S2604-921842, Vertical howser reels for manila rope.

TABLE 4
Horizontal Hawser Reels (7)

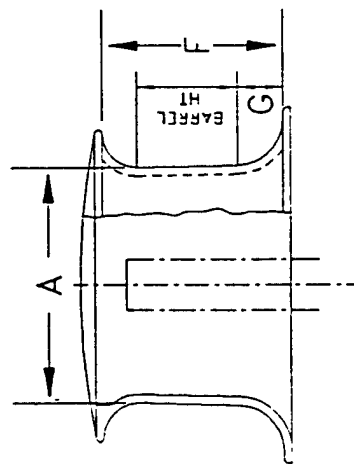
Reel type	Rope size		Capacity	A		B		C		Approx. gross weight		Approx. rope weight	
	in.	mm		in.	mm	in.	mm	in.	mm	lb	kg	lb	kg
A	3	76	300	32	813	38	965	21	533	330	150	485	220
	4	102	167	32	813	38	965	21	533	330	150	485	220
	5	127	100	32	813	38	965	21	533	330	150	485	220
B	6	152	100	38	965	39	991	24	610	380	172	875	397
C	7	178	100	38	965	39	991	24	610	380	172	875	397
	8	203	100	38	965	52	1321	24	610	440	200	1150	522



(7) NAVSHIPS Drawing S2604-921841, Horizontal hawser reels for manila rope.

TABLE 5
Capstan Head Sizes for Nylon Ropes (B)

Nylon rope circumference		A (Barrel diameter)		F		G		Barrel height		Nylon rope wrap height	
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
3	76	12	305	9.6	244	2.5	64	5.4	137	5.0	127
3-1/2 - 4	89-102	15	381	12.0	305	3.1	79	6.7	170	6.5	165
4-1/2	114	18	457	14.4	366	3.7	94	8.1	206	7.5	190
5 - 5-1/2	127-140	21	533	16.8	427	4.4	112	9.4	239	8.1	206
6 - 6-1/2	152-164	24	610	19.2	488	5.0	127	10.8	274	10.0	254
7	178	27	686	21.6	549	5.6	142	12.2	310	11.2	284
8	203	30	762	24.0	610	6.2	157	13.5	343	13.1	333
9	229	36	914	28.8	732	7.5	190	16.2	411	15.0	381



(8) NAVSHIPS Drawings S2601-860303, Capstan & gypsy heads.

Three-Strand Nylon Rope
MIL-R-17343

Circumference		Breaking strength		Standard length		NSN
inches	mm	lb	kN	feet	m	(4020-00-)
5/8	16	950	4.20	700	213	541-7075*
5/8	16	950	4.20	1200	365	263-3483*
5/8	16	950	4.20	2250	685	701-3044
5/8	16	950	4.20	2250	685	242-4083*
5/8	16	950	4.20	100	30	270-8245*
3/4	19	1500	6.65	2250	685	618-0261
3/4	19	1500	6.65	900	274	523-9461
3/4	19	1500	6.65	600	182	542-2523*
3/4	19	1500	6.65	200	61	929-0058*
1	25	2600	11.55	2250	685	641-8898
1	25	2600	11.55	42	12	593-9584
1-1/8	29	3300	14.65	1620	493	842-2431*
1-1/8	29	3300	14.65	1620	493	641-8899
1-1/4	32	4800	21.35	1200	365	753-2886
1-1/4	32	4800	21.35	50	15	530-2701
1-1/2	38	5800	25.80	1200	365	641-8900
1-1/2	38	5800	25.80	300	91	741-3154
1-3/4	44	7600	33.80	1200	365	560-7732
2	51	9800	43.80	1200	365	753-2887
2-1/4	57	13200	58.70	125	38	585-2530
2-1/2	64	15300	68.05	1200	365	573-2888
2-3/4	70	19000	84.50	1200	365	174-1231
3	76	23200	103.20	1200	365	752-8878
3-1/2	89	3200	142.30	1200	365	174-1232
4	102	41300	183.70	600	182	752-8879
4-1/2	114	50000	222.40	600	182	542-3306
5	127	60000	266.90	600	182	752-8890
5-1/2	140	72000	320.25	600	182	542-3307
6	152	90000	400.35	600	182	542-3308
6-1/2	165	100000	444.82	600	182	843-6306
7	178	127000	564.90	600	182	752-8891
8	203	164000	729.50	720	219	752-8892
8	203	164000	729.50	600	182	892-4028
9	229	209000	929.65	600	182	842-7465
10	254	265000	1178.75	600	182	843-6307

* An asterisk indicates an NSN for which an alternative (nonasterisked) NSN pertaining to the same rope size may be substituted when the order is filled.

Plaited Nylon
MIL-R-24337

Circumference		Breaking strength		Standard length		NSN
inches	mm	lb	kN	feet	m	m(4020-00-)
3/4	19	1,500	6.70	2250	685	106-9384
1	25	2,400	10.70	2250	685	106-9388
1-1/8	29	3,300	14.70	1620	494	106-9389
1-1/4	32	4,800	21.40	1200	365	106-9390
1-1/2	38	6,200	27.60	1200	365	106-9391
1-3/4	44	7,700	34.30	1200	365	106-9392
2	51	10,000	44.50	1200	365	106-9393
2-1/4	57	13,800	61.40	1200	365	106-9394
2-1/2	64	16,000	71.20	1200	365	106-9395
2-3/4	70	19,000	84.50	1200	365	106-9396
3	76	25,000	111.20	1200	365	106-9397
3-1/2	89	33,000	146.80	1200	365	106-9398
3-3/4	92	38,000	169.00	600	182	106-9399
4	102	43,000	191.30	600	182	106-9464
4-1/2	114	50,000	222.40	600	182	106-9400
5	127	60,000	266.90	600	182	106-9401
5-1/2	140	75,000	333.60	600	182	106-9261
6	152	86,000	382.50	600	182	106-9298
6-1/2	165	98,000	435.90	600	182	106-9333
7	178	117,000	520.40	600	182	106-9334
7-1/2	191	134,000	596.10	600	182	106-9335
8	203	153,000	680.60	600	182	106-9336
9	229	192,000	854.10	600	182	106-9337
10	254	237,000	1054.20	600	182	106-9338
11	279	280,000	1245.50	500	152	106-9339
12	305	345,000	1534.60	400	122	106-9340

Double Braided Nylon Rope
MIL-R-24050

Circumference		Breaking strength		Standard length		NSN
inches	mm	lb	kN	feet	m	(4020-)
3/4	19	1,700	7.55	600	182	00-106-9342
1	25	2,700	12.00	600	182	00-106-9341
1-1/8	29	3,900	17.30	600	182	00-946-0436
1-1/4	32	5,100	22.70	600	182	00-926-4529
1-1/2	38	6,900	30.70	600	182	00-106-9361
1-3/4	44	9,000	40.00	600	182	00-106-9364
2	51	12,000	53.40	600	182	00-106-9402
2	51	12,000	53.40	480	146	01-025-5175
2	51	12,000	53.40	300	91	01-025-5176
2	51	12,000	53.40	180	54	10-025-5177
2-1/4	57	15,000	66.70	600	182	00-106-9403
1-1/2	64	18,400	81.80	600	182	00-106-9404
2-3/4	70	22,500	100.10	600	182	00-106-9405
2-3/4	70	22,500	100.10	900	274	01-025-5172
2-3/4	70	22,500	100.10	300	91	01-025-5173
2-3/4	70	22,500	100.10	200	61	01-025-5174
3	76	26,500	117.90	600	182	00-471-9336
3-1/2	89	36,000	160.10	600	182	00-519-7916
3-3/4	92	42,000	186.80	600	182	00-106-9406
4	102	48,000	213.50	600	182	00-106-9407
4	102	48,000	213.50	900	274	01-025-5170
4	102	48,000	213.50	300	91	01-025-5171
4-1/2	114	60,000	266.90	600	182	00-106-9408
5	127	73,000	324.70	600	182	00-106-9409
5-1/2	140	90,000	400.30	600	182	00-106-9410
5-1/2	140	90,000	400.30	900	274	01-025-5178
5-1/2	140	90,000	400.30	300	91	01-025-5180
6	152	102,500	455.90	600	182	00-106-9411
6-1/2	165	123,000	547.10	600	182	00-106-9412
7	178	140,000	622.80	600	182	00-519-7946
7-1/2	191	160,000	711.90	600	182	00-486-6009
8	203	180,000	800.70	600	182	00-003-6293
8	203	180,000	800.70	1200	365	01-025-5179
9	229	225,000	1000.80	600	182	00-519-7951
10	254	273,000	1214.40	600	182	00-519-7960
11	279	325,000	1445.70	600	182	00-519-7980
12	305	385,000	1712.60	600	182	00-519-7992

Plaited Continuous Polyester Filament with Staple Wrap
MIL-R-24537

<u>Circumference</u>		<u>Breaking strength</u>		<u>Standard length</u>		<u>NSN</u>
inches	mm	lb	kN	feet	m	(4020-01-)
3/4	19	2,080	9.30	2250	685	029-2778
1	25	2,980	13.30	2250	685	028-3842
1-1/8	29	3,970	17.70	1620	493	028-3825
1-1/4	32	5,050	22.50	1200	365	028-3828
1-1/2	38	6,400	28.50	400	122	028-3826
1-1/2	38	6,400	28.50	800	244	028-3829
1-1/2	38	6,400	28.50	1200	365	028-3830
1-1/2	38	6,400	28.50	200	61	028-3843
1-3/4	44	8,100	36.00	1200	365	028-3839
2	51	9,900	44.00	1200	365	028-3831
2-1/4	57	12,200	54.30	1200	365	029-8664
1-1/2	64	14,500	64.60	1200	365	028-3832
2-3/4	70	16,700	74.30	1200	365	028-3833
3	76	19,000	84.50	400	122	028-3834
3	76	19,000	84.50	600	182	028-3835
3	76	19,000	84.50	1200	365	028-3841
3-1/4	83	22,000	97.90	200	61	028-3836
3-1/2	89	25,000	111.20	1200	365	028-3837
3-3/4	92	27,500	122.30	600	182	028-3840
4	102	30,700	136.60	600	182	028-3838
4-1/2	114	37,000	164.60	600	182	028-3827

Three-Strand Polyester

MIL-R-30500

<u>Circumference</u>		<u>Breaking strength</u>		<u>Standard length</u>		<u>NSN</u>
inches	mm	lb	kN	feet	m	(4020-)
5/8	16	800	3.60	2700	823	00-202-1345*
5/8	16	800	3.60	50	15	00-659-8923
3/4	19	1,200	5.30	2250	685	00-536-3476*
1	25	2,500	11.10	24	7	00-180-6546
1	25	2,500	11.10	2250	685	01-041-0789
1-1/4	32	3,800	16.90	1200	365	00-085-4424
1-1/2	38	5,000	22.20	1200	365	00-630-4873
3	76	18,500	82.30	1200	365	00-142-6115
4	102	31,000	137.90	600	182	00-630-4875

* An asterisk indicates an NSN for which an alternative (nonasterisked) NSN pertaining to the same rope size may be substituted when the order is filled.

Three-Strand Polypropylene
MIL-R-24049

Circumference		Breaking strength		Standard length		NSN
inches	mm	lb	kN	feet	m	(4020-00-)
3/4	19	1,000	4.45	2250	685	999-3894
1	25	1,700	7.55	900	274	530-0698
1	25	1,700	7.55	210	64	499-7529
1-1/2	38	3,700	16.45	50	15	874-7920
1-1/2	38	3,700	16.45	600	182	968-1352
2-1/4	57	7,000	31.15	200	61	874-7921
2-1/4	57	7,000	31.15	600	182	968-1354
3	76	13,000	57.80	600	182	968-1355

Double Braided Polyester Filament With Staple Wrap

MIL-R-24536

Circumference		Breaking strength		Standard length		NSN
inches	mm	lb	kN	feet	m	(4020-01-)
3/4	19	1,700	7.55	600	182	028-3823
1	25	2,600	11.55	600	182	028-3824
1-1/8	29	3,600	16.00	600	182	329-2775
1-1/4	32	4,700	20.90	600	182	028-3844
1-1/2	38	6,000	26.70	600	182	028-4526
1-3/4	44	7,900	35.15	600	182	028-4527
2	51	10,000	44.50	600	182	028-4525
2-1/4	57	12,200	54.25	600	182	028-6770
2-1/2	64	14,700	65.40	600	182	029-2776
2-3/4	70	17,400	77.40	600	182	028-4531
3	76	20,000	89.00	350	106	029-8665
3	76	20,000	89.00	700	213	028-3845
3-1/4	83	23,400	104.00	600	182	029-2777
3-1/2	89	26,700	118.75	600	182	028-3846
3-3/4	92	30,000	133.45	600	182	028-3822
4	102	33,700	150.00	350	106	029-8663
4	102	33,700	150.00	1200	365	028-4528
4-1/2	114	45,000	200.15	600	182	028-4529
5	127	50,000	222.40	600	182	028-4530

Three-Strand Dual Fiber
MIL-R-43942

<u>Circumference</u>		<u>Breaking strength</u>		<u>Standard length</u>		<u>NSN</u>
inches	mm	lb	kN	feet	m	(4020-01-)
3/4	19	1,130	5.00	2250	685	036-6819
1	25	1,710	7.60	2250	685	036-6820
1-1/8	29	2,430	10.80	1600	487	037-6290
1-1/2	38	3,960	17.60	1200	365	036-6291
2	51	5,760	25.60	1200	365	037-6292
2-1/4	57	7,560	33.60	1200	365	037-6293

Plaited Dual Fiber

MIL-R-43952

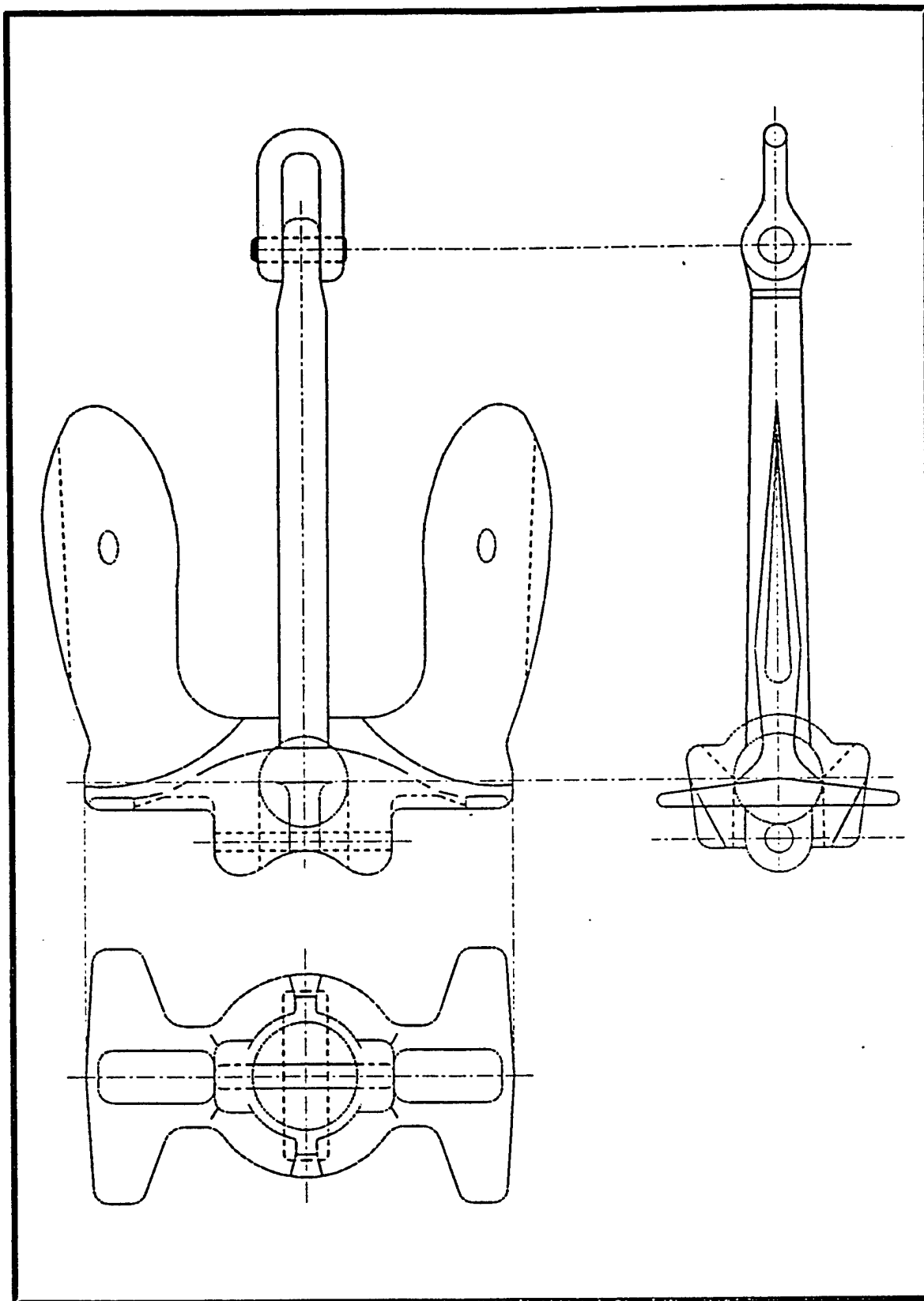
<u>Circumference</u>		<u>Breaking strength</u>		<u>Standard length</u>		<u>NSN</u>
inches	mm	lb	kN	feet	m	(4020-01-)
1-1/8	29	2,430	10.80	1600	487	038-4897
1-1/2	38	3,960	17.60	1200	365	038-4898
2-1/2	64	9,180	40.85	1200	365	038-4899

APPENDIX C

Minimum Number of Lines Used in Preliminary Mooring Analysis

In the preliminary design stage the following table may be used to prepare a mooring line arrangement for analysis purposes. All lines are presumed to be doubled up, with three parts per line.

Ship type	Displacement (long tons)	Number and size of mooring lines (heavy weather condition)	Camel width (feet)
Destroyers	2000 - 4000	Eight 5-inch	4
	4000 - 6000	Eight 6-inch	4
	6000 - 8000	Nine 6-inch	4
Cruisers	8000 - 12000	Two 8-inch, eight 6-1/2-inch	6
	12000 - 16000	Four 8-inch, eight 6-1/2-inch	6
Auxiliaries	15000 - 20000	Four 8-inch, eight 6-1/2-inch	6
	20000 - 25000	Four 9-inch, eight 6-1/2-inch	
	25000 - 30000	Four 9-inch, eight 7-inch	
Minesweepers		Six 5-inch	-
Tugs		Six 5-inch	-



U.S. Navy Stockless Anchor

CHAIN - 8-6-93 (C-40)

* FLASH BUTT-WELDED *
MIL-C-24633A

* NON-MAGNETIC FBW *
MIL-C-24774

WIRE DIA	BRK STR (#)	MX WT/SH	BRK STR (#)	MX WT/SH
3/4	75,000	525	64,800	563
7/8	98,000	713	88,200	765
1	129,000	925	115,200	1,000
1-1/8	161,000	1,150	145,800	1,270
1-1/4	198,000	1,430	180,000	1,565
1-3/8	235,000	1,760		
1-1/2	280,000	2,080		
1-5/8	325,000	2,390		
1-3/4	380,000	2,750		
1-7/8	432,000	3,150		
2	454,000	3,540		
2-1/8	510,000	3,980		
2-1/4	570,000	4,450		
2-3/8	628,000	4,960		
2-1/2	692,000	5,490		
2-5/8	758,000	6,280		
2-3/4	826,000	6,890		
2-7/8	897,000	7,520		
3	970,000	8,180		
3-1/8	1,046,000	8,890		
3-1/4	1,124,000	9,600		
3-3/8	1,204,000	10,350		
3-1/2	1,285,000	11,140		
3-5/8	1,369,000	12,190		
3-3/4	1,455,000	12,920		
3-7/8	1,543,000	13,850		
4	1,632,000	14,680		
4-1/8	1,724,000	15,520		
4-1/4	1,817,000	16,360		
4-3/8	1,911,000	17,200		
4-1/2	2,008,000	18,030		
4-5/8	2,105,000	18,840		
4-3/4	2,550,000	20,300		

FIBEROPE - 1-19-94 (O-49)

		* ARAMID 4-STR *		* POLYESTER DB *	
<% STRETCH @BRK STR>>		CID A-A-50435B <6%>		MIL-R-24677A <30%>	
NOM DIA	NOM CIRC	ACCPT B/S (#)	WT (#/F)	ACCPT B/S (#)	WT (#/F)
3/16 D	5/8 C				
1/4 D	3/4 C			1,900	0.020
5/16 D	1 C			2,935	0.031
3/8 D	1-1/8 C			4,245	0.045
7/16 D	1-1/4 C			*5,730*	0.061
1/2 D	1-1/2 C			7,500	0.080
9/16 D	1-3/4 C			9,450	0.101
5/8 D	2 C			11,660	0.125
3/4 D	2-1/4 C			16,610	0.179
13/16 D	2-1/2 C			19,580	0.211
7/8 D	2-3/4 C			22,660	0.244
1 D	3 C			29,480	0.319
1-1/16 D	3-1/4 C				
	3-3/8 C	50,000	0.329		
1-1/8 D	3-1/2 C	60,000	0.369	37,290	0.404
1-1/4 D	3-3/4 C	70,000	0.416	45,870	0.498
1-5/16 D	4 C			50,600	0.550
	4-1/8 C	96,000	0.503		
1-1/2 D	4-1/2 C			61,000	0.718
	4-3/4 C	135,000	0.657		
1-5/8 D	5 C			74,000	0.840
	5-3/8 C	180,000	0.859		
1-3/4 D	5-1/2 C			84,000	0.977
	5-7/8 C	225,000	1.13		
2 D	6 C			105,000	1.28
	6-1/4 C	280,000	1.42		
2-1/8 D	6-1/2 C			118,000	1.44
2-1/4 D	7 C			133,600	1.61
2-1/2 D	7-1/2 C			162,000	1.99
	7-5/8 C	350,000	1.74		
2-5/8 D	8 C			180,000	2.20
	8-3/16 C	420,000	2.09		
3 D	9 C			232,000	2.87
3-1/4 D	10 C			277,000	3.37
3-5/8 D	11 C			335,000	4.19
4 D	12 C			396,150	5.10
4-1/4 D	13 C			446,500	5.76
4-1/2 D	14 C			500,650	6.46
5 D	15 C			616,550	7.98
5-1/4 D	16 C			679,250	8.79

(1-5/16 C)

FIBEROPE - 1-19-94 (O-49)

<% STRETCH @BRK STR>>		* POLYESTER 12-STR * MIL-R-24750 <30%>		* POLYESTER 8-STR PL * MIL-R-24730 <45%>	
NOM DIA	NOM CIRC	ACCPT B/S (#)	WT (#/F)	ACCPT B/S (#)	WT (#/F)
3/16 D	5/8 C				
1/4 D	3/4 C			2,000	0.020
5/16 D	1 C			3,100	0.031
3/8 D	1-1/8 C	4,240	0.042	4,500	0.045
7/16 D	1-1/4 C	*5,680*	0.057	*6,000*	0.062
1/2 D	1-1/2 C	7,440	0.077	7,700	0.080
9/16 D	1-3/4 C	9,280	0.098	9,700	0.102
5/8 D	2 C	11,520	0.115	12,100	0.130
3/4 D	2-1/4 C	16,640	0.166	15,200	0.175
13/16 D	2-1/2 C			18,800	0.206
7/8 D	2-3/4 C	19,440	0.226	21,800	0.250
1 D	3 C	25,600	0.300	26,700	0.304
1-1/16 D	3-1/4 C				
	3-3/8 C				
1-1/8 D	3-1/2 C	32,800	0.380	35,900	0.400
1-1/4 D	3-3/4 C	37,600	0.440	40,200	0.464
1-5/16 D	4 C	43,200	0.500	45,600	0.525
	4-1/8 C				
1-1/2 D	4-1/2 C	54,400	0.630	56,900	0.670
	4-3/4 C				
1-5/8 D	5 C	67,200	0.780	69,500	0.820
	5-3/8 C				
1-3/4 D	5-1/2 C	80,800	0.940	82,000	0.980
	5-7/8 C				
2 D	6 C	96,000	1.12	97,200	1.18
	6-1/4 C				
2-1/8 D	6-1/2 C	113,600	1.32	112,000	1.35
2-1/4 D	7 C	131,200	1.53	129,000	1.57
2-1/2 D	7-1/2 C	151,200	1.76	149,000	1.81
	7-5/8 C				
2-5/8 D	8 C	172,000	2.00	167,000	2.04
	8-3/16 C				
3 D	9 C	215,200	2.53	208,000	2.58
3-1/4 D	10 C	264,800	3.12	255,000	3.18
3-5/8 D	11 C	319,200	3.78	306,000	3.84
4 D	12 C	376,800	4.49	365,000	4.54
4-1/4 D	13 C	440,800	5.27	429,000	5.40
4-1/2 D	14 C	508,800	6.12	496,000	6.30
5 D	15 C	581,600	7.02	570,000	7.20
5-1/4 D	16 C			638,000	8.20

(1-5/16 C)

(1-5/16 C)

FIBEROPE - 1-19-94 (O-49)

		* POLYESTER 3-STR *		* POLYESTER DB (SW) *	
<% STRETCH @BRK STR>>		MIL-R-30500B/2 <35%>		MIL-R-24536 <25%>	
NOM DIA	NOM CIRC	ACCPT B/S (#)	WT (#/F)	ACCPT B/S (#)	WT (#/F)
3/16 D	5/8 C	800	0.012		
1/4 D	3/4 C	1,200	0.021	1,700	0.017
5/16 D	1 C	2,000	0.032	2,600	0.026
3/8 D	1-1/8 C	2,800	0.046	3,600	0.038
7/16 D	1-1/4 C	3,800	0.062	4,700	0.053
1/2 D	1-1/2 C	5,000	0.081	6,000	0.067
9/16 D	1-3/4 C	6,500	0.105	7,900	0.091
5/8 D	2 C	8,000	0.132	10,000	0.118
3/4 D	2-1/4 C	10,000	0.175	12,200	0.149
13/16 D	2-1/2 C	13,000	0.198	14,700	0.185
7/8 D	2-3/4 C	15,000	0.250	17,400	0.222
1 D	3 C	18,500	0.300	20,000	0.267
1-1/16 D	3-1/4 C			23,400	0.313
	3-3/8 C				
1-1/8 D	3-1/2 C	25,000	0.420	26,700	0.364
1-1/4 D	3-3/4 C			30,000	0.417
1-5/16 D	4 C	31,000	0.525	33,700	0.476
	4-1/8 C				
1-1/2 D	4-1/2 C			45,000	0.599
	4-3/4 C				
1-5/8 D	5 C	48,000	0.808	50,000	0.741
	5-3/8 C				
1-3/4 D	5-1/2 C				
	5-7/8 C				
2 D	6 C	68,000	1.24		
	6-1/4 C				
2-1/8 D	6-1/2 C				
2-1/4 D	7 C	88,000	1.59		
2-1/2 D	7-1/2 C				
	7-5/8 C				
2-5/8 D	8 C	110,000	2.10		
	8-3/16 C				
3 D	9 C	140,000	2.63		
3-1/4 D	10 C	165,000	3.18		
3-5/8 D	11 C	240,000	4.00		
4 D	12 C	285,000	4.67		
4-1/4 D	13 C				
4-1/2 D	14 C				
5 D	15 C				
5-1/4 D	16 C				

FIBEROPE - 1-19-94 (O-49)

* POLYESTER PL (SW) *

* NYLON DB *

<% STRETCH @BRK STR>>

MIL-R-24537 <*25%*>

MIL-R-24050D <40%>

NOM DIA	NOM CIRC	ACCPT B/S (#)	WT (#/F)	ACCPT B/S (#)	WT (#/F)
3/16 D	5/8 C				
1/4 D	3/4 C	2,080	0.021	1,785	0.015
5/16 D	1 C	2,980	0.032	2,835	0.024
3/8 D	1-1/8 C	3,970	0.044	4,095	0.034
7/16 D	1-1/4 C	5,050	0.057	*5,355*	0.047
1/2 D	1-1/2 C	6,400	0.074	7,245	0.061
9/16 D	1-3/4 C	8,100	0.096	9,450	0.083
5/8 D	2 C	9,900	0.122	12,600	0.108
3/4 D	2-1/4 C	12,200	0.152	15,750	0.137
13/16 D	2-1/2 C	14,500	0.184	19,320	0.169
7/8 D	2-3/4 C	16,700	0.215	23,625	0.204
1 D	3 C	19,000	0.252	27,825	0.243
1-1/16 D	3-1/4 C	22,000	0.296		
	3-3/8 C				
1-1/8 D	3-1/2 C	25,000	0.336	37,800	0.331
1-1/4 D	3-3/4 C	27,500	0.378	44,100	0.380
1-5/16 D	4 C	30,700	0.425	50,400	0.433
	4-1/8 C				
1-1/2 D	4-1/2 C	37,000	0.630	64,200	0.546
	4-3/4 C				
1-5/8 D	5 C			78,110	0.676
	5-3/8 C				
1-3/4 D	5-1/2 C			96,300	0.820
	5-7/8 C				
2 D	6 C			109,675	0.971
	6-1/4 C				
2-1/8 D	6-1/2 C			131,610	1.14
2-1/4 D	7 C			149,800	1.32
2-1/2 D	7-1/2 C			171,200	1.52
	7-5/8 C				
2-5/8 D	8 C			192,600	1.73
	8-3/16 C				
3 D	9 C			243,000	2.19
3-1/4 D	10 C			284,840	2.70
3-5/8 D	11 C			351,000	3.27
4 D	12 C			415,800	3.89
4-1/4 D	13 C			475,200	4.50
4-1/2 D	14 C			548,640	5.24
5 D	15 C			622,080	6.00
5-1/4 D	16 C			702,000	6.85

* (@75%BS) *

* (1-5/16 C) *

FIBEROPE - 1-19-94 (O-49)

* NYLON 8-STR PL *

* NYLON 3-STR *

<% STRETCH @BRK STR>>

MIL-R-24337A <65%>

MIL-R-17343D <55%>

NOM DIA	NOM CIRC	ACCPT B/S (#)	WT (#/F)	ACCPT B/S (#)	WT (#/F)
3/16 D	5/8 C			950	0.010
1/4 D	3/4 C	1,500	0.014	1,500	0.016
5/16 D	1 C	2,500	0.023	2,600	0.028
3/8 D	1-1/8 C	3,700	0.035	3,300	0.036
7/16 D	1-1/4 C	5,000	0.049	4,800	0.051
1/2 D	1-1/2 C	6,400	0.062	5,800	0.063
9/16 D	1-3/4 C	8,000	0.075	7,600	0.083
5/8 D	2 C	11,000	0.102	9,800	0.106
3/4 D	2-1/4 C	17,000	0.141	13,200	0.143
13/16 D	2-1/2 C	20,000	0.162	15,300	0.169
7/8 D	2-3/4 C	24,000	0.195	19,000	0.207
1 D	3 C	31,000	0.250	23,200	0.253
1-1/16 D	3-1/4 C				
	3-3/8 C				
1-1/8 D	3-1/2 C	38,000	0.339	32,000	0.347
1-1/4 D	3-3/4 C	46,000	0.400	36,500	0.400
1-5/16 D	4 C	53,000	0.430	41,300	0.453
	4-1/8 C				
1-1/2 D	4-1/2 C	63,000	0.500	50,000	0.582
	4-3/4 C				
1-5/8 D	5 C	73,000	0.680	60,000	0.702
	5-3/8 C				
1-3/4 D	5-1/2 C	78,000	0.820	72,000	0.843
	5-7/8 C				
2 D	6 C	95,000	0.950	90,000	1.06
	6-1/4 C				
2-1/8 D	6-1/2 C	106,000	1.09	100,000	1.18
2-1/4 D	7 C	125,000	1.25	127,000	1.50
2-1/2 D	7-1/2 C	137,000	1.41		
	7-5/8 C				
2-5/8 D	8 C	165,000	1.67	164,000	1.95
	8-3/16 C				
3 D	9 C	200,000	2.14	209,000	2.51
3-1/4 D	10 C	250,000	2.62	265,000	3.20
3-5/8 D	11 C	300,000	3.19	316,000	3.85
4 D	12 C	360,000	3.84	375,000	4.58
4-1/4 D	13 C	380,000	4.46		
4-1/2 D	14 C	441,000	5.17		
5 D	15 C	507,000	5.95		
5-1/4 D	16 C	572,000	6.76		

FIBEROPE - 1-19-94 (O-49)

		* POLYPROPYLENE 3-STR *		* MANILA 3-STR *	
<% STRETCH @BRK STR>>		MIL-R-24049B <45%>		T-R-605B/3 <*20%*>	
NOM DIA	NOM CIRC	ACCPT B/S (#)	WT (#/F)	ACCPT B/S (#)	WT (#/F)
3/16 D	5/8 C	720	0.008	405	0.015
1/4 D	3/4 C	1,130	0.012	540	0.020
5/16 D	1 C	1,710	0.021	900	0.029
3/8 D	1-1/8 C	2,440	0.028	1,215	0.041
7/16 D	1-1/4 C	3,160	0.033	1,575	0.053
1/2 D	1-1/2 C	3,780	0.048	2,385	0.075
9/16 D	1-3/4 C	4,600	0.063	3,105	0.104
5/8 D	2 C	5,600	0.083	3,960	0.13
3/4 D	2-1/4 C	7,650	0.110	4,860	0.17
13/16 D	2-1/2 C	8,900	0.132	5,850	0.19
7/8 D	2-3/4 C	10,400	0.157	6,930	0.22
1 D	3 C	12,600	0.192	8,100	0.27
1-1/16 D	3-1/4 C			9,450	0.31
	3-3/8 C				
1-1/8 D	3-1/2 C	16,500	0.263	10,800	0.36
1-1/4 D	3-3/4 C	18,900	0.303	12,150	0.42
1-5/16 D	4 C	21,200	0.342	13,500	0.48
	4-1/8 C				
1-1/2 D	4-1/2 C	26,800	0.439	16,650	0.60
	4-3/4 C				
1-5/8 D	5 C	32,400	0.526	20,250	0.75
	5-3/8 C				
1-3/4 D	5-1/2 C	38,800	0.633	23,850	0.89
	5-7/8 C				
2 D	6 C	46,800	0.794	27,900	1.08
	6-1/4 C				
2-1/8 D	6-1/2 C	55,000	0.909		
2-1/4 D	7 C	62,000	1.11	36,900	1.46
2-1/2 D	7-1/2 C				
	7-5/8 C				
2-5/8 D	8 C	81,000	1.43	46,800	1.91
	8-3/16 C				
3 D	9 C	103,000	1.83	57,600	2.42
3-1/4 D	10 C	123,000	2.33	69,300	2.99
3-5/8 D	11 C			81,900	3.66
4 D	12 C			94,500	4.35
4-1/4 D	13 C				
4-1/2 D	14 C				
5 D	15 C				
5-1/4 D	16 C				

(REF)

FIBEROPE - 1-19-94 (O-49)

* SISAL 3-STR *

<% STRETCH @BRK STR>>

T-R-605B <*20%*>

NOM DIA	NOM CIRC	ACCPT B/S (#)	WT (#/F)
3/16 D	5/8 C	360	0.015
1/4 D	3/4 C	480	0.020
5/16 D	1 C	800	0.029
3/8 D	1-1/8 C	1,080	0.041
7/16 D	1-1/4 C	1,400	0.053
1/2 D	1-1/2 C	2,120	0.075
9/16 D	1-3/4 C	2,760	0.104
5/8 D	2 C	3,520	0.13
3/4 D	2-1/4 C	4,320	0.17
13/16 D	2-1/2 C	5,200	0.19
7/8 D	2-3/4 C	6,160	0.22
1 D	3 C	7,200	0.27
1-1/16 D	3-1/4 C	8,400	0.31
	3-3/8 C		
1-1/8 D	3-1/2 C	9,600	0.36
1-1/4 D	3-3/4 C	10,800	0.42
1-5/16 D	4 C	12,000	0.48
	4-1/8 C		
1-1/2 D	4-1/2 C	14,800	0.60
	4-3/4 C		
1-5/8 D	5 C	18,000	0.75
	5-3/8 C		
1-3/4 D	5-1/2 C	21,200	0.89
	5-7/8 C		
2 D	6 C	24,800	1.08
	6-1/4 C		
2-1/8 D	6-1/2 C		
2-1/4 D	7 C	32,800	1.46
2-1/2 D	7-1/2 C		
	7-5/8 C		
2-5/8 D	8 C	41,600	1.91
	8-3/16 C		
3 D	9 C	51,200	2.42
3-1/4 D	10 C	61,600	2.99
3-5/8 D	11 C	72,800	3.66
4 D	12 C	84,000	4.35
4-1/4 D	13 C		
4-1/2 D	14 C		
5 D	15 C		
5-1/4 D	16 C		

(REF)

SHACKL Size D	RR-C-271		RR-C-271		Crosby		Midland F		CooperT		Amd 1		Amd 1		Amd 1		Amd 1		Amd 1	
	Grade A	Grade B	Grade A	Grade B	Grade A	Grade B	Grade A	Grade B	Grade A	Grade B	Grade A	Grade B	Proof A	Proof B	Break A	Break B	Grade A	Grade B	Proof A	Proof B
3/16	520	900	1/3T	---	1/2T	---	1/3T	---	---	---	650	900	1,430	1,980	3,250	4,500	---	---	---	---
1/4	710	2,000	1/2T	---	3/4T	---	1/2T	---	---	---	1,000	2,000	2,200	4,400	5,000	10,000	---	---	---	---
5/16	1,060	3,120	3/4T	---	1T	---	3/4T	---	---	---	1,500	3,120	3,300	6,864	7,500	15,600	---	---	---	---
3/8	1,590	3,800	1T	---	1-1/2T	---	1T	---	2T	---	2,000	4,000	4,400	8,800	10,000	20,000	---	---	---	---
7/16	2,170	5,180	1-1/2T	---	2T	2-5/8T	1-1/2T	---	---	---	3,000	5,200	6,600	11,440	15,000	26,000	---	---	---	---
1/2	2,830	6,500	2T	---	3T	3-1/4T	2T	---	3-1/3T	---	4,000	6,600	8,800	14,520	20,000	33,000	---	---	---	---
9/16	3,580	---	---	---	---	---	---	---	---	---	5,180	8,200	11,396	18,040	25,900	41,000	---	---	---	---
5/8	4,420	10,000	3-1/4T	---	4-1/2T	5T	3-1/4T	---	---	---	6,500	10,000	14,300	22,000	32,500	50,000	---	---	---	---
3/4	6,360	13,800	4-3/4T	---	6-1/2T	7T	4-3/4T	---	7T	---	9,500	14,000	20,900	30,800	47,500	70,000	---	---	---	---
7/8	8,650	18,700	6-1/2T	---	8-1/2T	9-1/2T	6-1/2T	---	---	---	13,000	19,000	28,600	41,800	65,000	95,000	---	---	---	---
1-	11,310	24,400	8-1/2T	---	10T	12-1/2T	8-1/2T	---	12-1/2T	---	17,000	25,000	37,400	55,000	85,000	125,000	---	---	---	---
1-1/8	13,360	28,600	9-1/2T	---	12T	s15T;b17	9-1/2T	---	---	---	19,000	30,000	41,800	66,000	95,000	150,000	---	---	---	---
1-1/4	16,500	36,000	12T	---	14T	s18T;b21	12T	---	18T	---	24,000	36,000	52,800	79,200	120,000	180,000	---	---	---	---
1-3/8	19,800	41,400	13-1/2T	---	17T	s21T;b24	13-1/2T	---	---	---	27,000	42,000	59,400	92,400	135,000	210,000	---	---	---	---
1-1/2	23,740	48,800	17T	---	20T	s25T;b30	17T	---	30T	---	34,000	60,000	74,800	132,000	170,000	300,000	---	---	---	---
1-5/8	27,900	57,400	---	---	24T	s29T;b35	20T	---	---	---	40,000	70,000	88,000	154,000	200,000	350,000	---	---	---	---
1-3/4	32,320	65,000	25T	---	30T	s34T;b40	25T	---	40T	---	50,000	80,000	110,000	176,000	250,000	400,000	---	---	---	---
2-	42,220	85,040	35T	---	35T	s43T;b50	35T	---	50T	---	70,000	100,000	154,000	220,000	350,000	500,000	---	---	---	---
2-1/4	54,000	---	---	---	---	---	40T	---	---	---	80,000	128,000	176,000	281,600	400,000	640,000	---	---	---	---
2-1/2	67,600	121,400	55T	---	---	---	55T	---	---	---	110,000	160,000	242,000	352,000	550,000	800,000	---	---	---	---
2-3/4	81,000	---	---	---	---	---	60T	---	---	---	120,000	188,000	264,000	413,600	600,000	940,000	---	---	---	---
3-	96,200	150,000	85T	---	---	---	75T	---	---	---	170,000	220,000	374,000	484,000	850,000	1,100,000	---	---	---	---
3-1/2	131,100	200,000	120T	---	---	---	100T	---	---	---	240,000	280,000	528,000	616,000	1,200,000	1,400,000	---	---	---	---
4-	171,140	260,000	150T	---	---	---	---	---	---	---	300,000	350,000	660,000	770,000	1,500,000	1,750,000	---	---	---	---

NOM DIA	NOM CIRC	* WIRE/6X37 EIPS IWRC *			* WIRE/6X37 IPS IWRC *			* WIRE/6X37 IPS FC *		
		RR-W-410D TABLE XII			RR-W-410D TABLE XI			RR-W-410D TABLE X		
=====	=====	ACCPT B/S (#)	WT (#/F)	=====	ACCPT B/S (#)	WT (#/F)	=====	ACCPT B/S (#)	WT (#/F)	=====
3/16 D	5/8 C									
1/4 D	3/4 C	6,640	0.116		5,740	0.116		5,340	0.105	
5/16 D	1 C	10,280	0.180		8,940	0.180		8,300	0.164	
3/8 D	1-1/8 C	14,720	0.260		12,800	0.260		11,900	0.236	
7/16 D	1-3/8 C	19,900	0.350		17,340	0.350		16,120	0.320	
1/2 D	1-5/8 C	26,000	0.460		22,400	0.460		20,800	0.420	
9/16 D	1-3/4 C	32,800	0.590		28,200	0.590		26,400	0.530	
5/8 D	2 C	40,200	0.720		35,000	0.720		32,600	0.660	
3/4 D	2-3/8 C	57,400	1.04		50,000	1.04		46,400	0.950	
7/8 D	2-3/4 C	77,600	1.42		67,400	1.42		62,800	1.29	
1 D	3-1/8 C	100,800	1.85		87,600	1.85		81,600	1.68	
1-1/8 D	3-1/2 C	126,800	2.34		110,200	2.34		102,600	2.13	
1-1/4 D	3-7/8 C	155,800	2.89		135,400	2.89		126,000	2.63	
1-3/8 D	4-3/8 C	187,200	3.50		162,800	3.50		151,600	3.18	
1-1/2 D	4-3/4 C	222,000	4.16		192,800	4.16		179,400	3.78	
1-5/8 D	5-1/8 C	258,000	4.88		224,000	4.88		208,000	4.44	
1-3/4 D	5-1/2 C	298,000	5.67		260,000	5.67		242,000	5.15	
1-7/8 D	5-7/8 C	340,000	6.50		296,000	6.50		274,000	5.91	
2 D	6-1/4 C	386,000	7.39		336,000	7.39		312,000	6.72	
2-1/8 D	6-5/8 C	431,000	8.35		374,000	8.35		350,000	7.59	
2-1/4 D	7-1/8 C	482,000	9.36		420,000	9.36		390,000	8.51	
2-1/2 D	7-7/8 C	589,000	11.6		511,000	11.6		476,000	10.5	
2-3/4 D	8-5/8 C	704,000	14.0		612,000	14.0		570,000	12.7	
3 D	9-3/8 C	828,000	16.6		722,000	16.6		668,000	15.1	
3-1/4 D	10-1/4 C	960,000	19.5		836,000	19.5		798,000	17.7	
3-1/2 D	11 C	1,100,000	22.7		958,000	22.7		892,000	20.6	